CDM-710

Broadcast Satellite Modem
Installation and Operation Manual

(Includes data for the CDM-710 [70-140 MHz]
and CDM-710L [L-Band] Configurations)

Comtech EF Data is an
AS9100 Rev B / ISO9001:2000
Registered Company

IMPORTANT NOTE: The information contained in this document supersedes all previously published information regarding this product. Product specifications are subject to change without prior notice.

Part Number MN/CDM710.IOM Revision 11

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Table of Contents

TABLE OF CONTENTS ..... **III**

TABLES ..... **XI**

FIGURES ..... **XII**

PREFACE ..... **XIII**

About this Manual ..... **xiii**
Reporting Comments or Suggestions Concerning this Manual xiii

Conventions and References ..... **xiii**
Metric Conversion xiii
Recommended Standard Designations xiii
Trademarks xiv

Cautions and Warnings ..... **xiv**

Electrical Safety and Compliance ..... **xiv**
Fuses xiv
Low Voltage Directive (LVD) xiv
Installation xv

Environmental ..... **xv**

Telecommunications Terminal Equipment Directive ..... **xvi**

CE Mark ..... **xvi**

RoHS Compliance ..... **xvi**

EMC (Electromagnetic Compatibility) Compliance ..... **xvi**

Warranty Policy ..... **xvii**
Limitations of Warranty xvii
Exclusive Remedies xviii

Customer Support ..... **xix**
Online Customer Support xix

CHAPTER 1. INTRODUCTION **1–1**

1.1 Overview **1–1**
1.1.1 Standard and Optional Features 1–2

1.2 Functional Description 1–2

1.3 CDM-710 Broadcast Satellite Modem Features 1–4
1.3.1 Physical Description 1–4
1.3.2 Major Assemblies 1–5
1.3.3 Dimensional Envelope 1–6
1.3.4 Physical Features 1–7
1.3.4.1 Front Panel 1–7
1.3.4.2 Rear Panel 1–8
1.3.5 Allowable Data Interface Combinations 1–9
1.3.5.1 Additional Data Interface Information 1–10
1.3.6 Verification 1–10
1.3.7 Flash Upgrading Modem Firmware 1–10
1.3.8 Fully Accessible System Topology (FAST) 1–11
FAST System Theory 1–11
FAST Implementation 1–11
FAST Accessible Options 1–11

1.4 Summary of Specifications 1–13
1.4.1 Environmental and Physical 1–15
1.4.2 Modulator 1–15
1.4.2.1 CDM-710 (70/140 MHz) Modulator 1–15
1.4.2.2 CDM-710L (L-Band) Modulator 1–16
1.4.3 Demodulator 1–16
1.4.3.1 CDM-710 (70/140 MHz) Demodulator 1–16
1.4.3.2 CDM-710L (L-Band) Demodulator 1–17
1.4.4 Test Functions 1–19
1.4.5 Monitor Functions 1–19
1.4.6 Remote Port Operation 1–19
1.4.7 Data Rate Range 1–20

CHAPTER 2. INSTALLATION 2–1

2.1 Unpacking and Inspection 2–1

2.2 Mounting 2–2
2.2.1 Method A: Optional Rear-Mounting Support Brackets 2–2
2.2.2 Method B: Optional Bearingless Side-Railings 2–4

CHAPTER 3. REAR PANEL CONNECTORS AND PINOUTS 3–1

3.1 Overview 3–1

3.2 IF (J1 Tx / J3Rx) Connections 3–3

3.3 Terrestrial Data Connections 3–3
3.3.1 10/100 Ethernet Remote Port Connector Pinout, J4 3–3
3.3.2 SerDes Port Connector, J6 (Initially released chassis only) 3–3
3.3.3 ASYNC Port Connector Pinout, J6 (Rev. A and later chassis, *non-operational*) 3–4

3.4 Utility Connections 3–4

3.5 Power/Ground Connectors 3–6
3.5.1 AC Power Connector 3–6
3.5.2 Ground Connector (GND) 3–6

CHAPTER 4. FLASH UPGRADING 4–1

4.1 Flash Upgrading via Internet 4–1

4.2 CDM-710 Broadcast Satellite Modem Flash Upgrade Restrictions 4–2

4.3 Bulk Firmware Upgrade – Ethernet FTP Upload Procedure 4–3

4.4 10/100/1000 BASE-T (GigE) INTERFACE (CDI-70) FTP Upload Procedure 4–5

4.5 USB Procedure 4–5

CHAPTER 5. FRONT PANEL OPERATION 5–1

5.1 Introduction 5–1
5.1.1 Front Panel LED Indicators 5–2
5.1.2 Front Panel Keypad 5–3
5.1.3 Front Panel Vacuum Fluorescent Display (VFD) 5–4

5.2 Opening Screen 5–4
5.2.1 Menu Matrix 5–5

5.3 SELECT: (Main) Menu 5–6
5.3.1 SELECT: Config 5–7
5.3.1.1 (CONFIG:) Remote (Remote Control) 5–8
(CONFIG: Remote) Local 5–8
(CONFIG: Remote) Serial 5–8
(CONFIG: Remote) Serial → Interface 5–8
(CONFIG: Remote) Serial → Interface → RS232 5–9
(CONFIG: Remote) Serial → Interface → RS485-2W, -4W 5–9
(CONFIG: Remote) Serial → Interface → Baudrate 5–9
(CONFIG: Remote) Ethernet 5–9
(CONFIG: Remote) Ethernet → Gateway 5–9
(CONFIG: Remote) Ethernet → Address 5–10
(CONFIG: Remote) Ethernet → MAC 5–10
(CONFIG: Remote) Ethernet → SNMP 5–10
(CONFIG: Remote) Ethernet → SNMP → Community 5–10
(CONFIG: Remote) Ethernet → SNMP → Community → Read 5–10
(CONFIG: Remote) Ethernet → SNMP → Community → Traps 5–11
(CONFIG: Remote) Ethernet → SNMP → Community → Traps → IP1, IP2 5–11
(CONFIG: Remote) Ethernet → SNMP → Community → Traps → Version 5–11
5.3.1.2 (CONFIG:) Tx 5–11
(CONFIG: Tx) FEC 5–11

(CONFIG: Tx) Mod 5–12
(CONFIG: Tx:) Mod → Type 5–12
(CONFIG:Tx) Mod → Inv 5–12
(CONFIG: Tx) Mod → α 5–13
(CONFIG: Tx) Mod → Pilot *(DVB-S2 mode only)* 5–13
(CONFIG: Tx) Mod → Pilot → Off/On *(DVB-S2 mode only)* 5–13
(CONFIG: Tx) Mod → Pilot → Avg/Peak *(DVB-S2 mode only)* 5–13
(CONFIG: Tx) Mod → Frame *(DVB-S2 mode only)* 5–14
(CONFIG: Tx) Code 5–14
(CONFIG : Tx) SymRate 5–14
(CONFIG: Tx) Mode 5–16
(CONFIG: Tx) Mode → S2-G/S2-TS *(DVB-S2 mode only)* 5–17
(CONFIG: Tx) Frequency 5–17
(CONFIG: Tx) Pwr 5–17
(CONFIG: Tx) Pwr → Level 5–18
(CONFIG: Tx) Pwr → On/Off 5–18
(CONFIG: Tx) Pwr → Imped 5–18
(CONFIG: Tx) Scram *(DVB-S2 mode only)* 5–18
5.3.1.3 (CONFIG:) Rx 5–19
(CONFIG: Rx) FEC 5–19
(CONFIG: Rx) Dem (Demod) 5–19
(CONFIG: Rx) Dem → Type 5–19
(CONFIG: Rx) Dem → Inv 5–20
(CONFIG: Rx) Dem → Acq 5–20
(CONFIG: Rx) Dem → α 5–20
(CONFIG: Rx) Dem → Eq 5–20
(CONFIG: Rx) Dem → IQ-TP 5–21
(CONFIG: Rx) Dem → Pilot *(DVB-S2 mode only)* 5–21
(CONFIG: Rx) Dem → Scr (Descrambler)*(DVB-S2 mode only)* 5–21
(CONFIG: Rx) Code 5–21
(CONFIG: Rx) SymRate 5–22
(CONFIG: Rx) Mode 5–22
(CONFIG: Rx) Freq 5–22
(CONFIG: Rx) Eb/No 5–23
(CONFIG: Rx) Eb/No → Threshold 5–23
(CONFIG: Rx) Eb/No → Alarm/Fault 5–23
(CONFIG: Rx) PLL 5–23
5.3.1.4 (CONFIG:) Int1 (CDI-40 ASI Interface Only) 5–24
(CONFIG: Intfc1 ASI) Tx 5–24
(CONFIG: Intfc1 ASI) Tx → Ena/Dis 5–24
(CONFIG: Intfc1 ASI) Tx → Frame 5–24
(CONFIG: Intfc1 ASI) Rx 5–24
(CONFIG: Intfc1 ASI) Rx → Ena/Dis 5–24
(CONFIG: Intfc1 ASI) Rx →Frame 5–25
(CONFIG: Intfc1 ASI) Config 5–25
(CONFIG: Intfc1 ASI) Config → Port 5–25
(CONFIG: Intfc1 ASI) Config → Bandwidth 5–25
5.3.1.5 (CONFIG:) Int1 (CDI-60 HSSI Interface Only) 5–26
(CONFIG: Intfc1 HSSI) Tx 5–26

(CONFIG: Intfc1 HSSI) Tx → Data 5–26
(CONFIG: Intfc1 HSSI) Tx → Data → Datarate 5–26
(CONFIG: Intfc1 HSSI) Tx → Data → Invert 5–26
(CONFIG: Intfc1 HSSI) Tx → Clock 5–27
(CONFIG: Intfc1 HSSI) Tx → Enable 5–27
(CONFIG: Intfc1 HSSI) Rx 5–27
(CONFIG: Intfc1 HSSI) Rx → Data 5–27
(CONFIG: Intfc1 HSSI) Rx → Data → Datarate 5–27
(CONFIG: Intfc1 HSSI) Rx → Data → Invert 5–27
(CONFIG: Intfc1 HSSI) Rx → Buffer 5–28
(CONFIG: Intfc1 HSSI) Rx → Buffer → Size 5–28
(CONFIG: Intfc1 HSSI) Rx → Buffer → Recenter 5–28
(CONFIG: Intfc1 HSSI) Rx → Clock 5–28
(CONFIG: Intfc1 HSSI) Rx → Clock → Source 5–28
(CONFIG: Intfc1 HSSI) Rx → Clock → Invert 5–29
(CONFIG: Intfc1 HSSI) Rx → Enable 5–29
(CONFIG: Intfc1 HSSI) RTS/CTS 5–29
5.3.1.6 (CONFIG:) Int2 (CDI-70 Gigabit Ethernet Interface Only) 5–30
(CONFIG: Intfc2 Gigabit Ethernet) Ingress 5–30
(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Ena/Dis 5–30
(CONFIG: Intfc2 Gigabit Ethernet) Ingress → FEC 5–30
(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str 5–31
(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → IP 5–31
(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → IP → 1,2 5–31
(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → IP → 1,2 → Group 5–31
(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → IP → 1,2 → Source 5–31
(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → IP → Port 5–32
(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → Mode 5–32
(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → Pri 5–32
(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → Red 5–32
(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → Timeout 5–33
(CONFIG: Intfc2 Gigabit Ethernet) Egress 5–33
(CONFIG: Intfc2 Gigabit Ethernet) Egress → Ena/Dis 5–33
(CONFIG: Intfc2 Gigabit Ethernet) Egress → FEC 5–33
(CONFIG: Intfc2 Gigabit Ethernet) Egress → FEC → Ena/Dis 5–33
(CONFIG: Intfc2 Gigabit Ethernet) Egress → FEC → Matrix 5–34
(CONFIG: Intfc2 Gigabit Ethernet) Egress → IP 5–34
(CONFIG: Intfc2 Gigabit Ethernet) Egress → IP → Group 5–34
(CONFIG: Intfc2 Gigabit Ethernet) Egress → IP → SrcPort 5–34
(CONFIG: Intfc2 Gigabit Ethernet) Egress → IP → DestPort 5–34
(CONFIG: Intfc2 Gigabit Ethernet) Man 5–35
(CONFIG: Intfc2 Gigabit Ethernet) Stats 5–35
(CONFIG: Intfc2 Gigabit Ethernet) Stats → View 5–35
5.3.1.7 (CONFIG:) Ref 5–37
5.3.1.8 (CONFIG:) Aux 5–37
(CONFIG: Aux) Auto/Manual 5–37
(CONFIG: Aux) Ena/Dis 5–38
(CONFIG: Aux) FORCE(1:1) 5–38
5.3.1.9 (CONFIG:) Alarms 5–38
(CONFIG: Alarms) Tx 5–38

(CONFIG: Alarms) Intfc1 5–39
5.3.2 SELECT: Monitor 5–39
5.3.2.1 (Monitor:) Alarms 5–39
(Monitor: Alarms) Transmit 5–39
(Monitor: Alarms) Receive 5–40
(Monitor: Alarms) Unit 5–40
5.3.2.2 (Monitor:) Rx_Stats 5–42
5.3.2.3 (Monitor:) Event-Log 5–43
(Monitor:) Event-Log → View 5–43
(Monitor: Event-Log) Clear-All 5–43
5.3.3 SELECT: Test 5–43
5.3.3.1 (Test:) Mode 5–43
5.3.3.2 (Test:) TestPatterns 5–46
5.3.4 SELECT: Info 5–46
5.3.4.1 (INFO:) Rem 5–46
5.3.4.2 (INFO:) Tx 5–47
5.3.4.3 (INFO:) Rx 5–47
5.3.4.4 (INFO:) Intfc1 (CDI-40 ASI or CDI-60 HSSI Interfaces Only) 5–48
5.3.5 SELECT: Save/Load 5–49
5.3.5.1 (Save/Load:) Save 5–49
5.3.5.2 (Save/Load:) Load 5–50
5.3.6 SELECT: Util (Utility) 5–50
5.3.6.1 (UTIL:) RT-Clk 5–50
5.3.6.2 (UTIL:) Ref 5–51
5.3.6.3 (UTIL:) ID 5–51
5.3.6.4 (UTIL:) Display 5–51
5.3.6.5 (UTIL:) Firmware 5–51
(Firmware:) Info 5–52
(Firmware:) Info → Bootrom 5–52
(Firmware:) Info → Image#1, Image#1 5–52
(Firmware:) Select 5–52
5.3.6.6 (UTIL:) FAST 5–54
(FAST:) Cnfg (Configuration) 5–54
(FAST:) Cnfg → Code 5–54
(FAST:) Cnfg → Demo Mode 5–54
(UTIL:) FAST → View 5–55

CHAPTER 6. ETHERNET MANAGEMENT 6–1

6.1 Introduction 6–1

6.2 Ethernet Management Interface Protocols 6–1

6.3 SNMP Interface 6–2
6.3.1 Management Information Base (MIB) Files 6–2
6.3.1.1 Common Private MIBs 6–3
6.3.1.2 Modulator Private MIB 6–3
6.3.1.3 ASI Private MIB 6–3
6.3.1.4 Redundancy-Switch Private MIB 6–3

6.3.1.5 Gigabit Ethernet MIB 6–3
6.3.1.6 HSSI MIB 6–4
6.3.2 SNMP Community Strings 6–4
6.3.3 SNMP Traps 6–4

6.4 Telnet Interface 6–5
6.4.1 Caution Using Windows Telnet Client 6–5
6.4.2 Using Telnet 6–7

6.5 Web Server (HTTP) Interface 6–8
6.5.1 Web Server Interface Introduction 6–8
6.5.2 User Login 6–8
6.5.3 Web Server Menu Tree 6–9
6.5.4 Web Server Page Descriptions 6–9
6.5.4.1 Home Page 6–10
6.5.4.1.1 Home | Home (“Splash”) Page 6–10
6.5.4.1.2 Home | Contact Page 6–11
6.5.4.1.3 Home | Support Page 6–12
6.5.4.2 Admin Pages 6–13
6.5.4.2.1 Admin | Access Page 6–13
6.5.4.2.2 Admin | Remote Page 6–15
6.5.4.3 Config Mdm (Configure Modem) 6–16
6.5.4.3.1 Config Mdm | Interface 6–16
6.5.4.3.2 Config Mdm | Modem 6–18
6.5.4.3.3 Config Mdm | Modem Utilities 6–19
6.5.4.4 Stats (Statistics) Pages 6–21
6.5.4.4.1 Stats | Modem Status 6–21
6.5.4.4.2 Stats | Events & Statistics 6–22
6.5.4.5 Maint | Unit Info Page 6–23

CHAPTER 7. FORWARD ERROR CORRECTION OPTIONS 7–1

7.1 Introduction 7–1

7.2 Viterbi and Reed Solomon 7–1

7.3 LDPC and BCH 7–1
7.3.1 Range of Data Rates 7–2
7.3.2 Eb/No, Es/No Spectral Efficiency, and Occupied Bandwidth 7–2

CHAPTER 8. CDI-40 ASI INTERFACE MODULE 8–1

8.1 Introduction 8–1

8.2 Physical Description 8–1
8.2.1 Connector Pinouts 8–3

8.3 Functional Description 8–4
8.3.1 Input/Output Data Formats 8–4

8.3.1.1 MPEG-2 Null Packet 8–4
8.3.2 ASI Interface Defaults 8–5
8.3.3 1:1 Applications 8–5

8.4 General Specifications 8–6

CHAPTER 9. CDI-60 HSSI INTERFACE MODULE 9–1

9.1 Introduction 9–1

9.2 Physical Description 9–2
9.2.1 Connector Pinout 9–3

9.3 General Specifications 9–4

CHAPTER 10. CDI-70 1000 BASE-T GIGABIT ETHERNET (GIGE) INTERFACE MODULE 10–1

10.1 Introduction 10–1

10.2 Physical Description 10–2

10.3 J1 Connector Pinout, RJ45 10–3

10.4 General Specifications 10–4

10.5 Flash Upgrading the CDI-70 GigE Interface 10–6
10.5.1 CDI-70 GigE Interface Firmware Upgrade Procedure 10–7

APPENDIX A. REMOTE CONTROL A–1

A.1 Overview A–1

A.2 EIA-485 ..... A–1

A.3 EIA-232 ..... A–2

A.4 Basic Protocol A–2

A.5 Packet Structure A–3
A.5.1 Start of Packet A–3
A.5.2 Target Address A–3
A.5.3 Address Delimiter A–4
A.5.4 Instruction Code A–4
A.5.5 Instruction Code Qualifier A–4
A.5.6 Optional Message Arguments A–5
A.5.7 End Of Packet A–5

A.6 Remote Commands / Queries A–6
A.6.1 Modulator A–7

A.6.2 Demodulator A–20
A.6.3 Modem A–33
A.6.4 Priority System A–37
A.6.5 Modem Global Configuration (MGC) Command A–52
A.6.5.1 MGC Format A–52

APPENDIX B. EB/NO MEASUREMENT B–1

APPENDIX C. FAST ACTIVATION PROCEDURE C–1

C.1 FAST System Overview C–1
FAST System Theory C–1
FAST Implementation C–1
FAST Accessible Options C–1

C.2 FAST Activation Procedure C–2
C.2.1 Obtain Unit Serial Number C–2
C.2.2 View currently installed features C–2
C.2.3 Purchase FAST Access Code C–3
C.2.4 Enter FAST Access Code C–3

C.3 Using FAST Demo Mode C–4

Tables

Table 1-1. Definition of Points For Spectral Mask 1–14
Table 1-2. Eb/No Performance at Quasi Error Free PER = 10^{-7} with AWGN for DVB-S2 Operations 1–18
Table 1-3. Eb/No Performance for DVB-S QPSK Operations 1–18
Table 1-4. Eb/No Performance for DSNG 8-PSK Operations 1–19
Table 1-5. Eb/No Performance for DSNG 16-QAM Operations 1–19
Table 1-6. Data Rate Range: Standard FEC Frame (188 Byte Format) 1–21
Table 1-7. Data Rate Range: Short Frame (188 Byte Format) 1–22
Table 3-1. Modem Rear Panel Connectors 3–2
Table 5-1. Symbol Rate / Data Rate Range – Standard FECFrame and 188 Byte Format 5–15
Table 5-2. Symbol Rate / Data Rate Range – Short FECFrame and 188 Byte Format 5–16
Table 5-3. Statistics for the Gigabit Ethernet Interface 5–35
Table 5-4. Summary of Faults / Alarms (as reported per category) 5–40
Table 5-5. Summary of Firmware Info Screens (Image#1 and Image#2) 5–53
Table 7-1. Eb/No, Spectral Efficiency and Occupied Bandwidth* 7–3
Table 7-2. DVB-S2 Standard FECFrame = 64, 800 bits 7–4
Table 7-3. DVB-S2 Short FECFrame = 16,200 bits* 7–5
Table B-1. CDM-710 Co+No/No to C/N (Es/No) and Eb/No (dB) For DVB-S And DVB-DSNG B–3
Table B-2. CDM-710 Co+No/No to C/N (Es/No) and Eb/No (dB) For DVB-S2 QPSK and 8-APSK .. B–4
Table B-3. CDM-710 Co+No/No to C/N (Es/No) and Eb/No (dB) For DVB-S2 16-APSK and 32-APSK B–5

Figures

Figure 1-1. CDM-710 Broadcast Satellite Modem (Original and Current Production Units) 1–1
Figure 1-2. CDM-710 Block Diagram 1–2
Figure 1-3. CDM-710 Block Diagram 1–2
Figure 1-4. CDM-710 Dimensional Envelope 1–6
Figure 1-5. Front Panel View 1–7
Figure 1-6. Rear Panel View 1–8
Figure 1-7. Spectral Mask 1–14
Figure 1-8. Demodulator Input Level 1–17
Figure 2-1. Installation of Optional Rear-Mounting Support Brackets (KT/6228-2) 2–3
Figure 2-2. Installation of Optional Bearingless Side-Railings (FP/SL0006) 2–4
Figure 3-1. Rear Panel View 3–1
Figure 5-1. Flash Update via Internet 4–1
Figure 5-1. CDM-710 Front Panel View (Rev. A and later, L-Band version shown) 5–1
Figure 5-2. Keypad 5–3
Figure 5-3. Traffic Data Flow – Loopback Block Diagrams 5–45
Figure 6-1. CDM-710 Home (“Splash”) page 6–10
Figure 6-2. Home | Contact page 6–11
Figure 6-3. Home | Support page 6–12
Figure 6-4. Admin | Access page 6–13
Figure 6-5. Admin | Remote page 6–15
Figure 6-6. Config Mdm | Interface page 6–16
Figure 6-7. Config Mdm | Interface page (with Empty Slot) 6–17
Figure 6-8. Config Mdm | Modem page 6–18
Figure 6-9. Config Mdm | Modem Utilities page 6–19
Figure 6-10. Stats | Modem Status page 6–21
Figure 6-11. Stats | Events & Statistics page 6–22
Figure 6-12. Maint | Unit Info page 6–23
Figure 7-1. DVB-S QPSK BER versus Eb/No 7–6
Figure 7-2. DVB-DSNG 8-PSK BER versus Eb/No 7–7
Figure 7-3. DVB-DSNG 16-QAM 7–8
Figure 7-4. DVB-S2 QPSK Packet Error Rate versus Es/No 7–9
Figure 7-5. DVB-S2 8-PSK Packet Error Rate versus Es/No 7–10
Figure 7-6. DVB-S2 16-APSK Packet Error Rate versus Es/No 7–11
Figure 7-7. DVB-S2 32-APSK Packet Error Rate versus Es/No 7–12
Figure 8-1. CDI-40 ASI Interface Module 8–2
Figure 8-2. CDI-40 ASI Interface Module Block Diagrams 8–3
Figure 8-3. Typical PL/10881-4 CDI-40 ASI Interface 1:1 Application 8–5
Figure 9-1. CDI-60 HSSI Interface Module 9–1
Figure 9-2. CDI-60 HSSI Interface Module Block Diagram 9–2
Figure 9-3. CDI-60 HSSI Interface Module – Rear Panel View 9–3
Figure 9-4. Continuous and Gap Clock at TT 9–4
Figure 10-1. CDI-70 10/100/1000 Base-T Gigabit Ethernet (GigE) Interface Module 10–1
Figure 10-2. CDI-70 GigE Interface Module Block Diagram 10–2
Figure 10-3. Flash Update via Internet 10–6

PREFACE

About this Manual

This manual provides installation and operation information for the Comtech EF Data CDM-710 Broadcast Satellite Modem. This is a technical document intended for earth station engineers, technicians, and operators responsible for the operation and maintenance of the 70-140 MHz CDM-710 and its L-Band counterpart, the CDM-710L.

Revision 11 of this manual represents a complete rewrite in which all content has been updated in its entirety and re-ordered to conform with current Comtech EF Data Technical Publicatons standards and practices.

Reporting Comments or Suggestions Concerning this Manual

Comments and suggestions regarding the content and design of this manual will be appreciated. To submit comments, please contact the Comtech EF Data Technical Publications Department:

TechnicalPublications@comtechefdata.com

Conventions and References

Metric Conversion

Metric conversion information is located on the inside back cover of this manual. This information is provided to assist the operator in cross-referencing non-Metric to Metric conversions.

Recommended Standard Designations

Recommended Standard (RS) Designations have been superseded by the new designation of the Electronic Industries Association (EIA). References to the old designations may be shown when depicting actual text displayed on the Web or Telnet (i.e., remote control) interface pages for the unit (e.g., RS-232). All other references in the manual will be shown with the EIA designations.

Trademarks

Product names mentioned in this manual may be trademarks or registered trademarks of their respective companies and are hereby acknowledged.

The user should carefully observe the following information:

Cautions and Warnings

IMPORTANT ***or*** **NOTE** ***indicates a statement associated with the task being performed or information critical for proper equipment function.***

CAUTION ***indicates a hazardous situation that, if not avoided, may result in minor or moderate injury.*** **CAUTION** ***may also be used to indicate other unsafe practices or risks of property damage.***

WARNING ***indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.***

Electrical Safety and Compliance

The CDM-710 has been shown to comply with the **EN 60950 Safety of Information Technology Equipment (Including Electrical Business Machines)** safety standard.

The equipment is rated for operation over the range 100 to 240 VAC. It has a maximum power consumption of 60 watts, and draws a maximum of 600 mA.

Fuses

FOR CONTINUED OPERATOR SAFETY, ALWAYS REPLACE THE FUSES WITH THE CORRECT TYPE AND RATING.

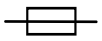
The CDM-710 is fitted with two fuses - one each for line and neutral connections. These are contained within the body of the IEC power inlet connector, behind a small plastic flap.

- For 115 and 230 volt AC operation, use T2.00A, 20mm fuses.
- For 48 VDC operation, use T6.25A, 6.3x32mm fuses.

Low Voltage Directive (LVD)

The following information is applicable for the European Low Voltage Directive (2006/95/EC):

Symbol	Description
<HAR>	Type of power cord required for use in the European Community.
	CAUTION: Double-pole/Neutral Fusing ACHTUNG: Zweipolige bzw. Neutralleiter-Sicherung

International Symbols			
Symbol	**Definition**	**Symbol**	**Definition**
	Alternating Current		Protective Earth
	Fuse		Chassis Ground

For additional symbols, refer to* Cautions and Warnings *listed earlier in this Preface.

Installation

The installation and connection to the line supply must be made in compliance to local or national wiring codes and regulations.

The CDM-710 is designed for connection to a power system that has separate ground, line and neutral conductors. The equipment is not designed for connection to power system that has no direct connection to ground.

The CDM-710 is shipped with a line inlet cable suitable for use in the country of operation. If it is necessary to replace this cable, ensure the replacement has an equivalent specification. Examples of acceptable ratings for the cable include HAR, BASEC and HOXXX-X. Examples of acceptable connector ratings include VDE, NF-USE, UL, CSA, OVE, CEBEC, NEMKO, DEMKO, BS1636A, BSI, SETI, IMQ, KEMA-KEUR and SEV.

Environmental

The CDM-710 must not be operated in an environment where the unit is exposed to extremes of temperature outside the ambient range 0° to 50°C (32° to 122°F); precipitation, condensation, or humid atmospheres above 95% relative humidity; altitudes (un-pressurized) greater than 2000 meters; excessive dust or vibration; flammable gases; or corrosive or explosive atmospheres.

Operation in vehicles or other transportable installations that are equipped to provide a stable environment is permitted. If such vehicles do not provide a stable environment, safety of the equipment to EN60950 may not be guaranteed.

Telecommunications Terminal Equipment Directive

In accordance with the Telecommunications Terminal Equipment Directive 91/263/EEC, this equipment should not be directly connected to the Public Telecommunications Network.

CE Mark

Comtech EF Data declares that the CDM-710 meets the necessary requirements for the CE Mark.

RoHS Compliance

This unit satisfies (with exemptions) the requirements specified in the European Union Directive on the Restriction of Hazardous Substances, Directive 2002/95/EC, (EU RoHS).

EMC (Electromagnetic Compatibility) Compliance

In accordance with European Directive 2004/108/EEC, the CDM-710 has been shown, by independent testing, to comply with the following standards:

Emissions: EN 55022 Class B - Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment.

(Also tested to FCC Part 15 Class B.)

Immunity: EN 55024 – Information Technology Equipment: Immunity Characteristics, Limits, and Methods of Measurement.

Additionally, the CDM-710 has been shown to comply with the following standards:

EN 61000-3-2 – Harmonic Currents Emission;

EN 61000-3-3 – Voltage Fluctuations and Flicker.

To ensure that the CDM-710 continues to comply with these standards, observe the following instructions:

- Connections to the transmit and receive L-Band ports (Type ‘N’ female connectors) should be made using a good quality coaxial cable.
- All 'D' type connectors attached to the rear panel must have back-shells that provide continuous metallic shielding. Cable with a continuous outer shield (either foil or braid, or both) must be used, and the shield must be bonded to the back-shell.
- The equipment must be operated with its cover on at all times. If it becomes necessary to remove the cover, the user should ensure that the cover is correctly refitted before normal operation commences.

Warranty Policy

Comtech EF Data products are warranted against defects in material and workmanship for a specific period from the date of shipment, and this period varies by product. In most cases, the warranty period is two years. During the warranty period, Comtech EF Data will, at its option, repair or replace products that prove to be defective. Repairs are warranted for the remainder of the original warranty or a 90 day extended warranty, whichever is longer. Contact Comtech EF Data for the warranty period specific to the product purchased.

For equipment under warranty, the owner is responsible for freight to Comtech EF Data and all related customs, taxes, tariffs, insurance, etc. Comtech EF Data is responsible for the freight charges only for return of the equipment from the factory to the owner. Comtech EF Data will return the equipment by the same method (i.e., Air, Express, Surface) as the equipment was sent to Comtech EF Data.

All equipment returned for warranty repair must have a valid RMA number issued prior to return and be marked clearly on the return packaging. Comtech EF Data strongly recommends all equipment be returned in its original packaging.

Comtech EF Data Corporation's obligations under this warranty are limited to repair or replacement of failed parts, and the return shipment to the buyer of the repaired or replaced parts.

Limitations of Warranty

The warranty does not apply to any part of a product that has been installed, altered, repaired, or misused in any way that, in the opinion of Comtech EF Data Corporation, would affect the reliability or detracts from the performance of any part of the product, or is damaged as the result of use in a way or with equipment that had not been previously approved by Comtech EF Data Corporation.

The warranty does not apply to any product or parts thereof where the serial number or the serial number of any of its parts has been altered, defaced, or removed.

The warranty does not cover damage or loss incurred in transportation of the product.

The warranty does not cover replacement or repair necessitated by loss or damage from any cause beyond the control of Comtech EF Data Corporation, such as lightning or other natural and weather related events or wartime environments.

The warranty does not cover any labor involved in the removal and or reinstallation of warranted equipment or parts on site, or any labor required to diagnose the necessity for repair or replacement.

The warranty excludes any responsibility by Comtech EF Data Corporation for incidental or consequential damages arising from the use of the equipment or products, or for any inability to use them either separate from or in combination with any other equipment or products.

A fixed charge established for each product will be imposed for all equipment returned for warranty repair where Comtech EF Data Corporation cannot identify the cause of the reported failure.

Exclusive Remedies

Comtech EF Data Corporation's warranty, as stated is in lieu of all other warranties, expressed, implied, or statutory, including those of merchantability and fitness for a particular purpose. The buyer shall pass on to any purchaser, lessee, or other user of Comtech EF Data Corporation's products, the aforementioned warranty, and shall indemnify and hold harmless Comtech EF Data Corporation from any claims or liability of such purchaser, lessee, or user based upon allegations that the buyer, its agents, or employees have made additional warranties or representations as to product preference or use.

The remedies provided herein are the buyer's sole and exclusive remedies. Comtech EF Data shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Customer Support

Refer to p. xvii in this Preface for information regarding this product's Warranty Policy.

Contact the Comtech EF Data Customer Support Department for:

- Product support or training
- Reporting comments or suggestions concerning manuals
- Information on upgrading or returning a product

A Customer Support representative may be reached at:

Comtech EF Data
Attention: Customer Support Department
2114 West 7th Street
Tempe, Arizona 85281 USA

480.333.2200 (Main Comtech EF Data number)
480.333.4357 (Customer Support Desk)
480.333.2161 FAX

To return a Comtech EF Data product (in-warranty and out-of-warranty) for repair or replacement:

- **Contact** the Comtech EF Data Customer Support Department. Be prepared to supply the Customer Support representative with the model number, serial number, and a description of the problem.
- **Request** a Return Material Authorization (RMA) number from the Comtech EF Data Customer Support representative.
- **Pack** the product in its original shipping carton/packaging to ensure that the product is not damaged during shipping.
- **Ship** the product back to Comtech EF Data. (Shipping charges should be prepaid.)

Online Customer Support

An **RMA number request** can be requested electronically by contacting the Customer Support Department through the online support page at **www.comtechefdata.com/support.asp**:

- **Click** on the "Service" hyperlink, then read the "Return Material Authorization" section for detailed instructions on our return procedures.
- **Click** on the "RMA Request Form" hyperlink, then fill out the form completely before sending.
- **Send e-mail** to the Customer Support Department at **service@comtechefdata.com**.

Notes:

Chapter 1. INTRODUCTION

1.1 Overview

The CDM-710 Broadcast Satellite Modem (**Figure 1-1**) is a high symbol/bit-rate unit, intended for operation in broadcast and enterprise applications. It operates over satellite links at symbol/data rates up to 45 Msps. Various modulations and coding combinations compliant with DVB-S, DVB-DSNG and DVB-S2 are provided.

The operating frequency of the CDM-710 is available in the following versions:

CDM-710 (70/140 MHz)	52 to 88 MHz and 104 to 176 MHz in 100 Hz resolution.
CDM-710L (L-Band)	950 to 2000 MHz in 100 Hz resolution.

Individual Modulator and Demodulator cards are available for the CDM-710 for operation at either 70 /140 MHz or L-Band. The terrestrial data interfaces, as depicted in the block diagram shown in **Figure 1-2**, are field removable to allow different interface types:

- CDI-40 Duplex ASI Interface
- CDI-60 HSSI Interface
- CDI-70 1000 Base-T Gigabit Ethernet (GbE) Ethernet Interface

Chassis - Initially released version

Chassis – Rev. A and later versions

Figure 1-1. CDM-710 Broadcast Satellite Modem (Original and Current Production Units)

The CDM-710 is compact, being 1RU high x 18.65 inches deep, with low power consumption. It has a front panel Vacuum Fluorescent Display (VFD) and keypad for local configuration and control, although it can be fully remote-controlled via its RS-485 bus or 10/100 Base-T Ethernet Interface.

1.1.1 Standard and Optional Features

The CDM-710 operates in DVB-S (QPSK), DVB-DSNG (8-PSK and 16-QAM) and DVB-S2 (QPSK, 8-PSK, 16-APSK, and 32-APSK) modes. The modem is operated from the front panel using the keypad and display or remote controlled via an RS-232 / RS-485 2/4 Wire bus or 10/100 Base-T Ethernet port located on the base modem.

The modem is available for either 70/140 MHz or L-Band applications. The standard 70/140 MHz Tx-IF port has a BNC female connector that is programmable for either with 50Ω or 75Ω impedance operations. Spectral rolloffs of 20, 25, and 35% are available.

1.2 Functional Description

A block diagram of the CDM-710 is shown in **Figure 1-2**.

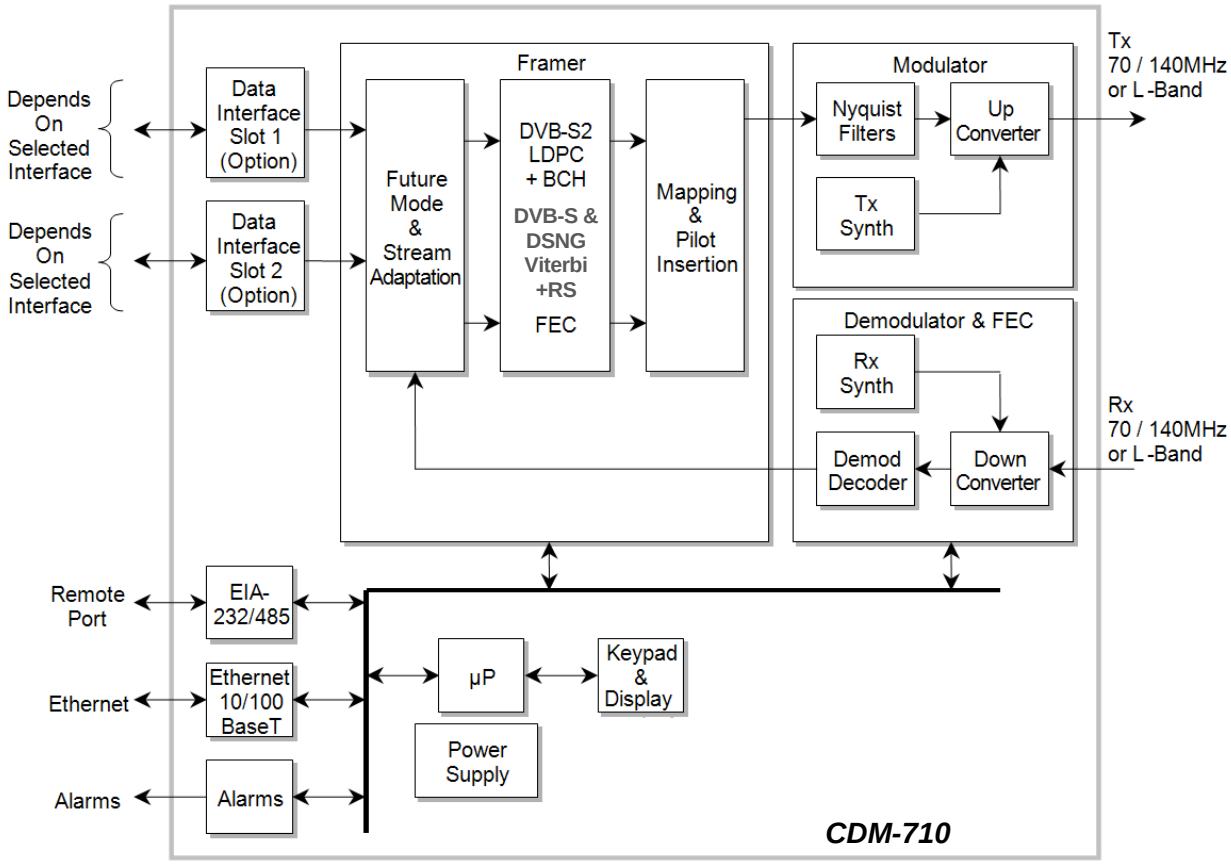


Figure 1-3. CDM-710 Block Diagram

The CDM-710 is constructed as a 1RU-high rack-mounting chassis, which can be freestanding, if desired. Handles at the front facilitate removal from and placement into a rack.

The CDM-710 performs several key functions:

- It accepts incoming data from the terrestrial interface and converts it into appropriate clock and data signals.
- The modulator operates on the data to frame and encode it for transmission.
- Encoded information is mapped for modulation.
- A modulated carrier is transmitted from the IF interface for use by uplink equipment for delivery to the satellite.
- A carrier received from the satellite link is acquired and demodulated to recover symbols and timing.
- Error correction and deframing are performed.
- User data is delivered to the to the data interface.

Transmit (Tx) data is delivered to the data interface where it is converted to clock and data signals for further processing. Depending upon the type of interface, clock and data are provided or in other cases the clock is embedded in the data and clock recovery is performed to generate clock and data signals.

A **F**irst-**I**n –**F**irst-**O**ut (FIFO) follows the terrestrial interface to facilitate delivery of the data to the framing card. Data is passed to the **F**orward **E**rror **C**orrection (FEC) Encoder where the data is framed and encoded in accordance with either the DVB-S, DVB-DSNG, or DVB-S2 formats.

After encoding the data is passed to the modulator where the I and Q signals are mapped to generate the appropriate constellation (QPSK, 8-PSK, 16-QAM, 16-APSK, and 32-APSK) and filtered to provide the desired spectral rolloff.

Finally, a carrier is generated by a frequency synthesizer in conjunction with the I and Q signals to produce a frequency range as follows:

CDM-710 (70/140 MHz):	52 to 88 or 104 to 176 MHz IF output signal at the connector on the modem.
CDM-710L (L-Band):	950 to 2000 MHz output signal at the Frequency connector on the modem.

An Rx carrier from the satellite is received by the demodulator and reverses the process performed by the modulator. The demodulator has an FEC decoder that corrects errors incurred during transmission to improve the integrity of the data delivered to the data interface. A synthesizer in the demodulator is programmed to select the desired carrier from the transponder.

1.3 CDM-710 Broadcast Satellite Modem Features

1.3.1 Physical Description

Constructed as a 1RU-high rack-mount chassis, the CDM-710 can be free-standing if desired. Handles at the front facilitate removal from and placement into a rack.

The operator may configure and monitor the CDM-710 from the front panel, or through the remote M&C port. Control and status is provided through the RS-232, RS-485 (2Wire or 4Wire) port or 10/100 Base-T Ethernet port. The management Ethernet port supports SNMP, Telnet and HTTP (Web browser) operation.

The CDM-710 is physically comprised of several main card assemblies:

- The Data Interface card is a plug-in module that is readily installed or removed at the rear of the unit.

  Note: Power must be turned off to remove or install the data interfaces. Any attempt to remove or install a data face without first turning off the power to the unit will result in damage to the data interface.

- The Framer Card receives signals from the data interface card and routes signals to the FEC Encoder and Modulator. The microcontroller for the unit also resides on the Framer Card and is the embedded controller for the entire modem. The microcontrollers handle all of the monitor and control for the unit including the front panel keypad and display, the RS-232 and RS-485 2Wire/4Wire remote port, and the 10/100 Ethernet port. Interface with the other the modules in the modem is provided by the framer assembly.

- The FEC Encoder card is a plug-in module that resides on the Framer card. It generates the encoded stream used by the modulator card.

- The Modulator card plugs into the framer card. It maps and spectrally shapes the I&Q data for delivery to the IF interface.

- The Demodulator card also plugs into the framer. It recovers the selected carrier, performs error correction and delivers data stream to the framer card.

1.3.2 Major Assemblies

"Later units" pertains to Rev A and later chassis. Refer to the Notes that follow the table.

Later Units	Earlier Units	Description
PL/10002-1	PL/10002-1	Modulator, 70/140 MHz
	PL/11230-1	Modulator, L-Band Card (Early Units)
PL/12113-1		Modulator, L-Band Card (Later Units)
PL/10003-1	PL/10003-1	Demodulator, 70/140 MHz
PL/11571-1	PL/11571-1	Demodulator, L-Band
	PL/10005-1	Encoder FEC, Tx LDPC and DVB-S (Early Units)
PL/12148-1		Encoder FEC, Tx LDPC and DVB-S, -DSNG, -S2 (Later Units)
PL/12169-1	N/A	Decoder FEC, Rx LDPC and DVB-S, -DSNG, -S2
	PL/10012-1	Framing Card with 1.5 ppm reference (Early Units)
PL/12000-1		Framing Card (Later Units)
PL/10881-4		CDI-40 DVB-ASI Interface Card for 1:1 (and 1:N) Note 5
	PL/10881-3	CDI-40 DVB-ASI Interface Card for 1:N Note 5
	PL/11509-1	CDI-70 10/100/1000 Base-T (GbE) Interface (FW11509) Note 6
PL/11509-2		CDI-70 10/100/1000 Base-T (GbE) Interface (FW12547) Note 6
PL/11582-1		CDI-60 HSSI Interface Note 7

Notes:

1. Earlier units are Tx only; and are not upgradeable to 16APSK or higher.
2. Earlier units do not support redundancy and are not upgradeable.
3. Later units are version 2.1.1 or later (FW/12437)
4. Earlier units are version 1.1.3 or earlier (FW/12050).
5. CDI-40 PL/10881-3 and PL/10881-4 have hardware differences that are not upgraded by Reflash. See para. 1.2.3 for 1:1 and 1:N application information.
6. The CDI-70 PL/11509-1 is upgraded to PL/11509-2 function by Reflash.
7. The CDI-60 PL/11582-1 requires version 3.0.1 or later firmware. Generic operation requires version 4.1.1 or later.

1.3.3 Dimensional Envelope

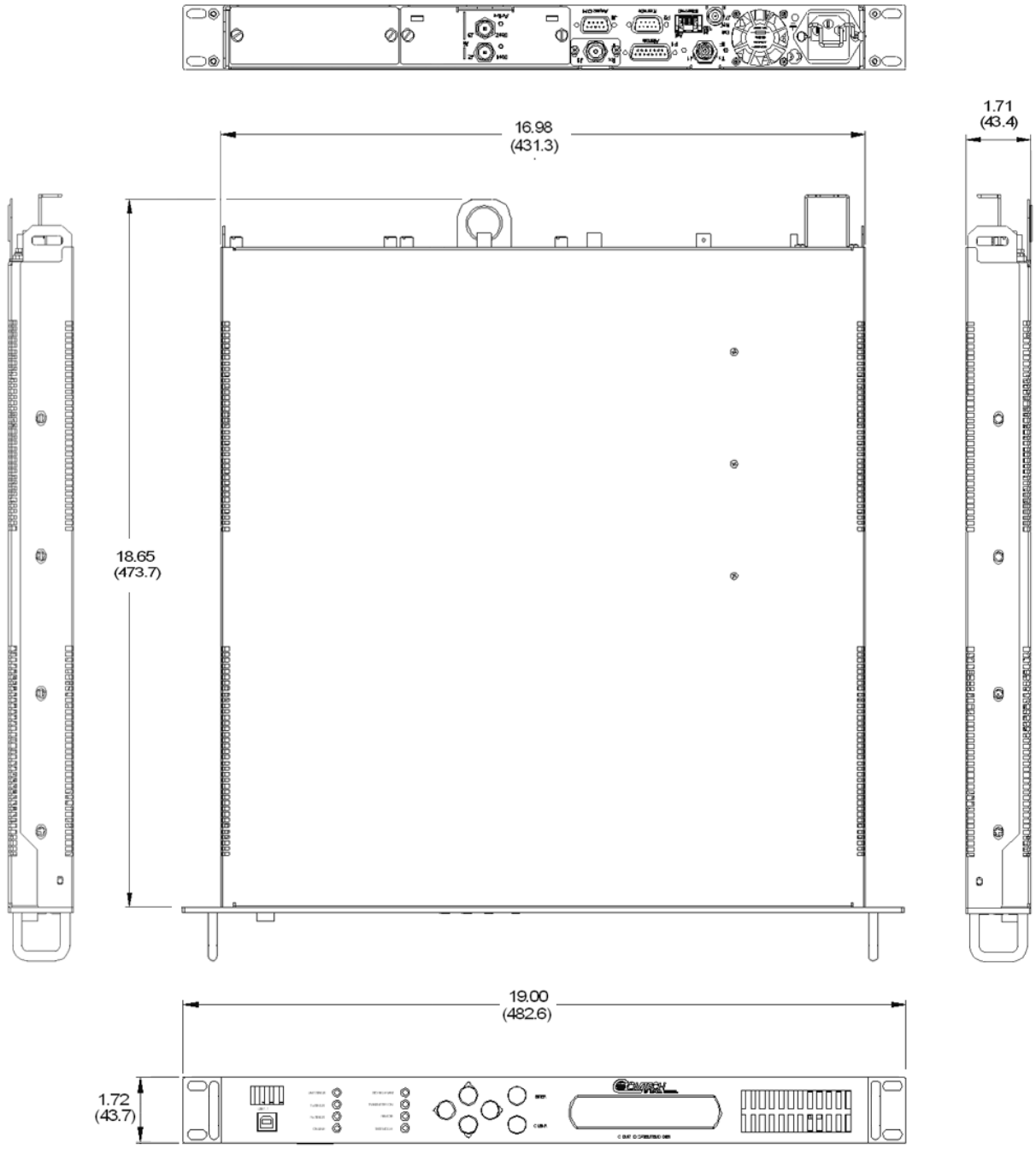


Figure 1-4. CDM-710 Dimensional Envelope

1.3.4 Physical Features

1.3.4.1 Front Panel

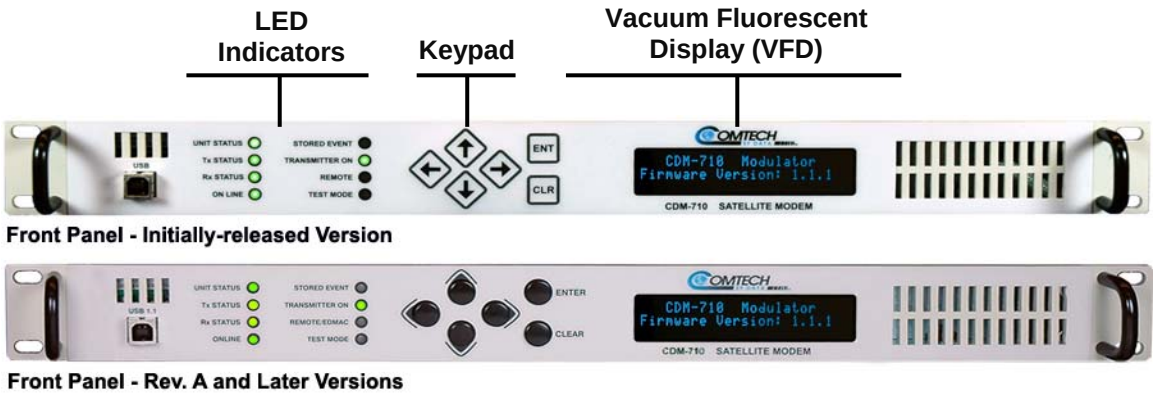


Figure 1-5. Front Panel View

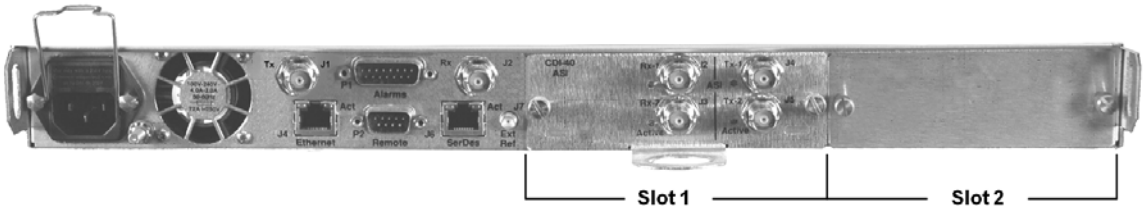
Figure 1-5 shows the front panel of the CDM-710 High-Speed Satellite Modem. The front panel features (from left) **L**ight-**E**mitting-**D**iode (LED) indicators; a keypad; and a **V**acuum **F**luorescent **D**isplay (VFD):

- The eight (8) LEDs indicate, in a summary fashion, the status of the unit.
- The keypad comprises six individual keyswitches. They have a positive 'click' action, which provides tactile feedback. Note that, per the above figure, the initially-released version featured switches behind a sealed membrane overlay.

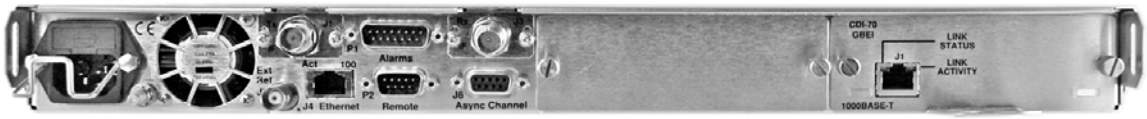
  The user enters data via the keypad, and messages are displayed on the VFD.
- The VFD is an active display showing two lines of 24 characters each. It produces a blue light with adjustable brightness. Compared to a **L**iquid **C**rystal **D**isplay (LCD), the VFD has greatly superior viewing characteristics and does not suffer problems of viewing angle or contrast.

The function and behavior of the LED indicators, keypad, and VFD is described in detail in **Chapter 5. FRONT PANEL OPERATION**.

1.3.4.2 Rear Panel



Initially released chassis (70/140 MHz shown with optional CDI-40 ASI interface)



Rev. A and later chassis (70/140 MHz shown with optional CDI-70 Gigabit Ethernet interface)

Figure 1-6. Rear Panel View

Figure 1-6 shows the rear panel of the CDM-710. External cables are attached to connectors on the rear panel of the CDM-710. Each connector is described in detail in **Chapter 3. REAR PANEL CONNECTORS AND PINOUTS**.

1.3.5 Allowable Data Interface Combinations

Data interfaces are installed or removed from the rear of the CDM-710 chassis into Slot 1 and Slot 2 of the CDM-710. The allowable combination of data interfaces and the data interfaces that are supported for redundancy are found in the table that follows. In all cases, *only one data interface is active at a time*.

Additional information relating to the data interfaces supported in 1:1 and 1:N support is also provided.

1:1 Redundancy with the CRS-170A (70/140 MHz) and CRS-180 (L-Band): The **"Allowable CDM-710 Modem Configuration"** column in the table that follows shows the data interface combinations of the modem that are supported by the CRS-170A and CRS-180 1:1 Redundancy Switches. First, the 1:1 switch is selected depending upon the operating frequency, and then a data interface kit for Slot 1 and Slot 2 is chosen. More information on these kits is provided in the CRS-170A or CRS-180 1:1 Redundancy Switch datasheet and Installation and Operation manual.

1:N Redundancy with the CRS-300: The CRS-300 was originally designed for operation with the CDM-600 and subsequently adapted to a number of other modems. It is capable of supporting interfaces up to the point where there are no more paths left to route traffic. This is the reason why the CRS-300 supports a limited set of the interface combinations supported by the CDM-710.

CDM-710 Modem Configuration		1:N CRS-300 Configuration		Notes
Interface Slot 1	Interface Slot 2	TMI Card	RMI Card	
ASI (CDI-40)	None	CRS-325	CRS-306	-
ASI (CDI-40)	GbE (CDI-70)			Can be used as Redundant Modem
HSSI (CDI-60)	None	CRS-336	CRS-306	-
None	GbE (CDI-70)			-
HSSI (CDI-60)	GbE (CDI-70)			Can be used as Redundant Modem

Notes:

1. The Redundant Modem must have the same interface cards in each slot as any of the Traffic Modems.
2. The Traffic Modem must have the same interface cards in each slot as any of the other Traffic Modems have, or a blank panel installed.
3. **Interface Slots 1 and 2 are not active simultaneously**.

1.3.5.1 Additional Data Interface Information

Interface	Number	1:1 Capability	1:N Capability
ASI (CDI-40)	PL/10881-3 Also See Chapter 8	The original ASI card. Supports Tx, Rx or Duplex in non-redundant applications. or Tx-only in 1:1	OK Tx, Rx or Duplex Rx output (J2 and J3) is the standard ASI level
ASI (CDI-40)	PL/10881-4 Also See Chapter 8	The later ASI card Supports Tx, Rx or Duplex 1:1 or non-redundant applications. The Rx output from J2 is the standard ASI level and Rx output from J3 is higher so the standard level is delivered after a 3 dB combiner.	OK Tx, Rx or Duplex in 1:N applications, excluding Rx output on J3.
HSSI (CDI-60)	PL/11582-1	OK Tx, Rx or Duplex	OK Tx, Rx or Duplex
Gigabit Ethernet (CDI-70)	PL/11509-2	OK Tx, Rx or Duplex	OK Tx, Rx or Duplex

1.3.6 Verification

The unit includes a number of tests for rapid verification of the correct functioning of the unit. Selection of a CW carrier permits measurement of carrier center frequency or phase noise characteristic. A single-sideband carrier also is available at the operating symbol rate to check I and Q phase and amplitude balance. When normal operation is again selected, all of the previous values are restored.

1.3.7 Flash Upgrading Modem Firmware

The internal firmware is both powerful and flexible, permitting storage and retrieval of up to 10 different modem configurations. The CDM-710 uses 'flash memory' technology internally, and new firmware can be uploaded to the unit from an external PC. This simplifies software upgrading, and updates can be sent via the Internet (using www.comtechefdata.com, Comtech EF Data's Web site), by e-mail, or on CD. The upgrade can be performed without opening the unit simply by connecting the CDM-710 to the Ethernet port of a computer. See **Chapter 4. FLASH UPGRADING** for further information.

1.3.8 Fully Accessible System Topology (FAST)

The CDM-710 is extremely flexible and powerful, and incorporates a large number of optional features. In order to permit a lower initial cost, the modem may be purchased with only the desired features enabled.

If, at a later date, a user wishes to upgrade the functionality of a modem, Comtech EF Data provides **F**ully **A**ccessible **S**ystem **T**opology (**FAST**), which permits the purchase and installation of options through special authorization codes loaded into the unit either via the front panel keypad or entered remotely via the remote port located on the modem rear panel.

These unique access codes may be purchased at any time from Comtech EF Data.

FAST System Theory

FAST facilitates on-location upgrade of the operating feature set without removing a modem from the setup.

With **FAST** technology, operators have maximum flexibility for enabling functions as they are required. **FAST** allows an operator to order a modem precisely tailored for the initial application.

When service requirements change, the operator can upgrade the topology of the modem to meet those requirements within minutes. This accelerated upgrade can be accomplished because of **FAST**'s extensive use of the programmable logic devices incorporated into Comtech EF Data products.

FAST Implementation

Comtech EF Data's **FAST** system is factory-implemented in the modem. All **FAST** options are available through the basic platform unit at the time of order – **FAST** allows immediate activation of available options, after confirmation by Comtech EF Data, through the front panel keypad or via the remote control interface.

See **Appendix C. FAST ACTIVATION PROCEDURE** for further information.

FAST Accessible Options

Hardware options for basic modems can be ordered and installed either at the factory or in the field. The operator can select options that can be activated easily in the field, depending on the current hardware configuration of the modem. A unique access code enables configuration of the available hardware.

The following tables show the available FAST and FAST-accessible hardware options:

Transmit Configurations			
Tier	**FAST Option**	**Modulation**	**Max Symbol Rate (Msps)**
1	DVB-S	QPSK	45
2	DVB-S DVB-DSNG	QPSK 8-PSK, 16-QAM	45 45
3	DVB-S2	QPSK, 8PSK	45
4	DVB-S2	QPSK, 8PSK, 16APSK	45 35
5	DVB-S2 DVB-S	QPSK, 8PSK, QPSK	45 45
6	DVB-S2 DVB-S	QPSK, 8PSK, 16APSK QPSK	45 35 45
7	DVB-S2 DVB-S DVB-DSNG	QPSK, 8PSK, 16APSK QPSK 8-PSK, 16-QAM	45 35 45 45
8	DVB-S2 DVB-S DVB-DSNG	QPSK, 8PSK, 16APSK 32-APSK QPSK 8-PSK, 16-QAM	45 35 28 45 45

Receive Configurations			
Tier	**FAST Option**	**Modulation**	**Max Symbol Rate (Msps)**
1	DVB-S2 DVB-S	QPSK, 8PSK, QPSK	45 45
2	DVB-S2 DVB-S	QPSK, 8PSK, 16APSK QPSK	45 35 45
3	DVB-S2 DVB-S DVB-DSNG	QPSK, 8PSK, 16APSK QPSK 8-PSK, 16-QAM	45 35 45 45
4	DVB-S2 DVB-S DVB-DSNG	QPSK, 8PSK, 16APSK 32-APSK QPSK 8-PSK, 16-QAM	45 35 28 45 45

1.4 Summary of Specifications

Description	Requirements
Type: DVB-S2 DVB-S DVB-DSNG	EN 302 307 EN 301 421 EN 301 210
Symbol Rate: DVB-S DVB-S2 DVB-DSNG	1 to 45 Msps 1 to 45 Msps (QPSK, 8PSK), 35 Msps (16APSK), 28 Msps (32APSK) 1 to 45 Msps
Data Rate	Corresponds to symbol rate. See Sect. 1.5.7
Symbol Rate / Data Rate	See modulator/demodulator
Modulation/FEC: DVB-S2 DVB-S DVB-DSNG	 QPSK 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 LDPC + BCH 8-PSK 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 LDPC + BCH 16-APSK 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 LDPC + BCH 32-APSK 3/4, 4/5, 5/6, 8/9, 9/10 QPSK 1/2, 2/3, 3/4, 5/6, 7/8 Convolutional + Reed Solomon 8-PSK 2/3, 5/6, 8/9 Convolutional + Reed Solomon 16-QAM 3/4, 7/8 Convolutional + Reed Solomon
Operating Modes	CCM only
Transport Streams	Only Single Transport Stream supported
Spectral Mask	20%, 25%, or 35% (per DVB-S, DSNG, S2) – See **Figure 1-7** and **Table 1-1**.
M&C/Remote Port	RS-232 and RS-485 2W/4W with Comtech EF Data protocol 10/100 Base-T Ethernet with HTTP, SNMP or Telnet
Physical (PL) Layer Scrambling	User specified value (one) of n = 0 to 262,141, per EN 302 307.
Pilot Insertion	Selection for On or Off
Reflash	Ethernet port
Frequency Reference	Selectable
Internal Reference	10 MHz for data and IF, stability ± 1.5 ppm
External Clock	For data interfaces only, not IF. Clock Input depends upon data interface module.
External Ref	1, 2, 5, 10 or 20 MHz for IF, internally phase locked. Input is 50 or 75Ω compatible with 0.5 to 4.0 Up-p sine or square wave. Requires high stability source.
1:1 Redundancy	Built in controller for operation with optional CRS-170A for L-Band and CRS-180 for 70/140 MHz
Fault	Form C, see connector pinout information and notes
Configuration	Non-volatile for 1-year minimum and returns upon power up.
External Tx Carrier Off	TTL low signal – path bypasses microprocessor (Alarm Conn)
Agency Approval	Safety, conducted and radiated emissions and Immunity sufficient for CE certification

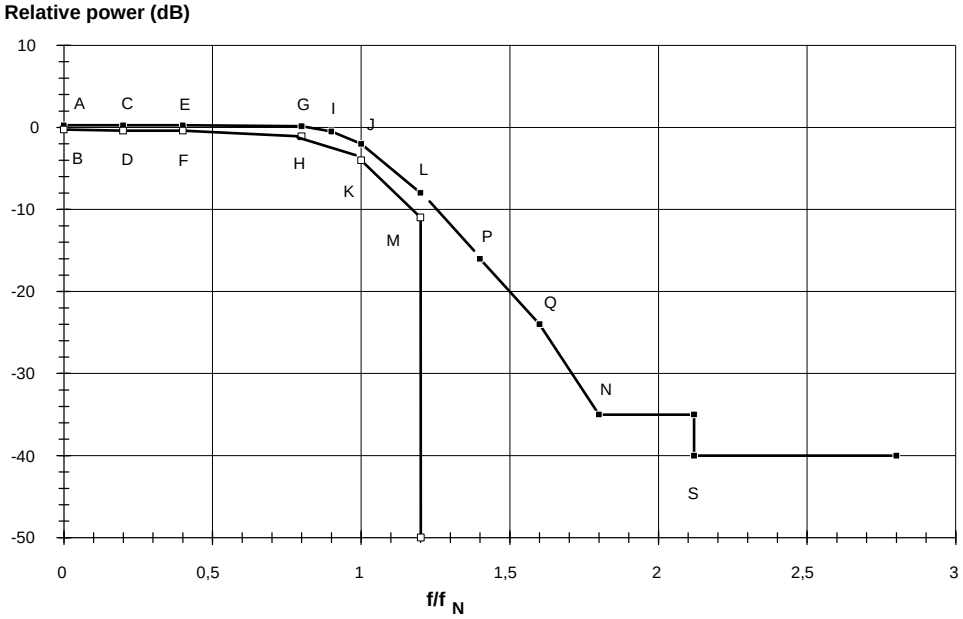


Figure 1-7. Spectral Mask

Table 1-1. Definition of Points For Spectral Mask

Point	Frequency for α=0,35	Frequency for α=0,25	Frequency for α=0,20	Relative power (dB)	Group delay
A	0,0 f_N	0,0 f_N	0,0 f_N	+0,25	+0,07/f_N
B	0,0 f_N	0,0 f_N	0,0 f_N	-0,25	-0,07/f_N
C	0,2 f_N	0,2 f_N	0,2 f_N	+0,25	+0,07/f_N
D	0,2 f_N	0,2 f_N	0,2 f_N	-0,40	-0,07/f_N
E	0,4 f_N	0,4 f_N	0,4 f_N	+0,25	+0,07/f_N
F	0,4 f_N	0,4 f_N	0,4 f_N	-0,40	-0,07/f_N
G	0,8 f_N	0,86f_N	0,89 f_N	+0,15	+0,07/f_N
H	0,8 f_N	0,86 f_N	0,89 f_N	-1,10	-0,07/f_N
I	0,9 f_N	0,93 f_N	0,94 f_N	-0,50	+0,07/f_N
J	1,0 f_N	1,0 f_N	1,0 f_N	-2,00	+0,07/f_N
K	1,0 f_N	1,0 f_N	1,0 f_N	-4,00	-0,07/f_N
L	1,2 f_N	1,13 f_N	1,11 f_N	-8,00	-
M	1,2 f_N	1,13 f_N	1,11 f_N	-11,00	-
N	1,8 f_N	1,60 f_N	1,5 f_N	-35,00	-
P	1,4 f_N	1,30 f_N	1,23 f_N	-16,00	-
Q	1,6 f_N	1,45 f_N	1,4 f_N	-24,00	-
S	2,12 f_N	1,83 f_N	1,7 f_N	-40,00	-

1.4.1 Environmental and Physical

Description		Requirements
Temperature	Operating	0 to 50ºC (32 to 122ºF)
	Storage	-20 to 70ºC (-4 to 158ºF)
Humidity	Operating	95% maximum, non-condensing
	Storage	99% maximum, non-condensing
Power Supply Input	AC	100-240V AC 50/60Hz, auto-ranging
	DC	-48 VDC
Fuse	AC	T2.00A 5x20 mm 250VAC time lag
	DC	T6.25A, 6.3x32mm (3AG), 250VAC time lag
Power Consumption		< 75 W, 55W typical
AC Power Cord Retainer		Standard
Modular design		Simplex or Duplex
Dimensional Envelope, 1RU		1.72H x 19.00W x 18.65D inches (4.37H x 48.26W x 47.37D cm)
Weight		15lbs (6.8 kg)
Front Panel Operational Features	Keypad	Up, down, left, right, Clear, and Enter keys
	Display	24-characters/line x 2 lines Vacuum Fluorescent Display (VFD)
	LEDs	8 status LEDs

1.4.2 Modulator

1.4.2.1 CDM-710 (70/140 MHz) Modulator

Description	Requirements
Frequency	52 to 88 MHz or 104 to 176 MHz in 100 Hz steps. Bandwidth of transmitted spectrum is within IF frequency range.
Impedance	75Ω or 50Ω, programmable
Connector	BNC Female
Return Loss	18 dB
Output Power	0 to -20 dBm in 0.1 dB steps. Carrier is not interrupted when changing between output power levels or removing data connections.
Output Power Accuracy	± 0.5 dB at 25°C
Output Power Stability	Within ± 0.5 dB of 25C value over all specified environments
Carrier Mute	55 dB below main carrier output
Harmonics and Spurious	-55 dBc/4 kHz over operating frequency range (excludes spectral mask area) and is with a modulated carrier. -55 dBc/4 kHz 10 to 52 MHz, 176 to 250 MHz
Integrated Phase Noise	Continuous component < 1 degrees RMS double-sided, 100 Hz to 10 MHz
Spectral Inversion	Normal or Inverted
Quadrature Phase Error	< 2°
Quadrature Amplitude Imbalance	0.2 dB maximum
Carrier Null	35 dB below an unmodulated carrier
Combined Amplitude Imbalance and Quadrature Phase Error	Single sideband test with suppressed sideband 35 dB minimum below unmodulated carrier

1.4.2.2 CDM-710L (L-Band) Modulator

Description	Requirements
Frequency	950 to 2000 MHz in 100 Hz steps. Bandwidth of transmitted spectrum is within IF frequency range.
Impedance	50Ω
Connector	Type N Male
Return Loss	15 dB
Output Power	-5 to -25 dBm in 0.1 dB steps. Carrier is not interrupted when changing between output power levels or removing data connections.
Output Power Accuracy	± 0.5 dB at 25°C
Output Power Stability	Within ± 0.5 dB of 25C value over all specified environments
Carrier Mute	55 dB below main carrier output
Harmonics and Spurious	-55 dBc/4 kHz over operating frequency range (excludes spectral mask area) and is with a modulated carrier. -55 dBc/4 kHz 250 to 950 MHz, 1950 to 2500 MHz
Integrated Phase Noise	Continuous component < 1 degrees RMS double-sided, 100 Hz to 10 MHz
Spectral Inversion	Normal or Inverted
Quadrature Phase Error	< 2°
Quadrature Amplitude Imbalance	0.2 dB maximum
Carrier Null	35 dB below an unmodulated carrier
Combined Amplitude Imbalance and Quadrature Phase Error	Single sideband test with suppressed sideband 35 dB minimum below unmodulated carrier

1.4.3 Demodulator

1.4.3.1 CDM-710 (70/140 MHz) Demodulator

Description	Requirements
Frequency Range	52 to 88 and 104 to 176 MHz in 100 Hz steps
Impedance/Connector	50 Ω or optional 75 Ω/BNC Female
Return Loss	18 dB
Input Power, Minimum	-58 + 10xLog(Symbol Rate in MHz) dBm, -58 dBm at 1 Msps, -41.5 dBm at 45 Msps. See **Figure 1-8**.
AGC Range	45 dB above minimum
Max Composite Level	+20 dBc composite to desired up to +10 dBm
Acquisition Range	± 100 kHz programmable in 1 kHz steps
Acquisition Time	Typical < 10 seconds, DVB-S2 Pilots On.
Adaptive Equalizer	Up to 3 dB tilt
BER Performance	See **Table 1-2** through **Table 1-5**
IQ Test Point	Accessible from rear panel Alarm connector

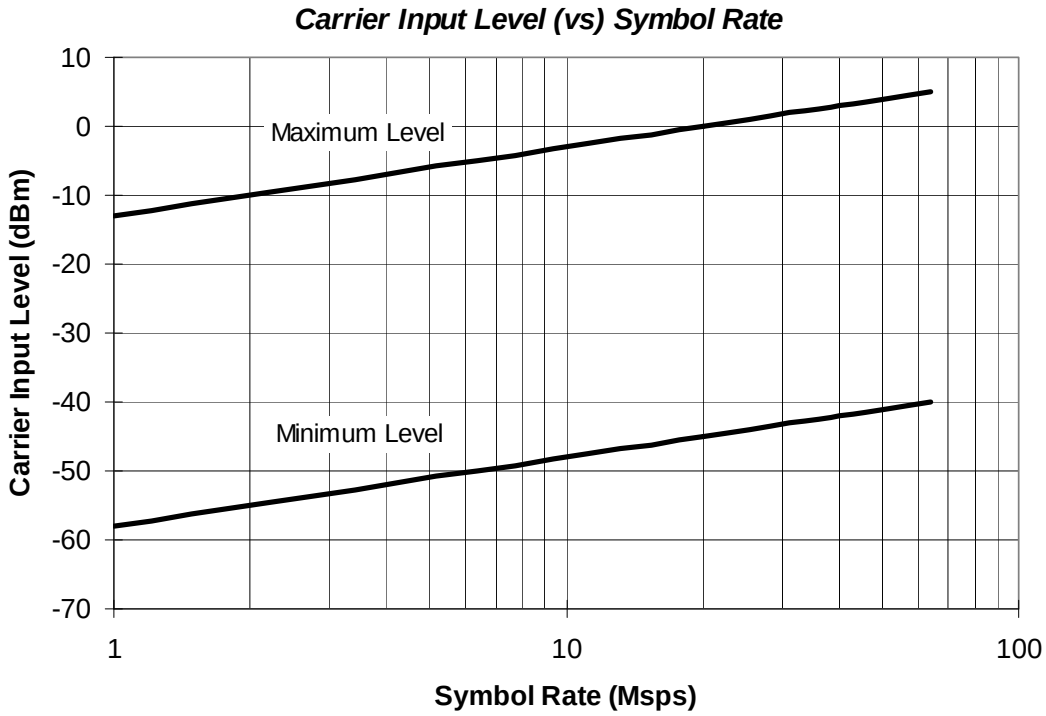


Figure 1-8. Demodulator Input Level

1.4.3.2 CDM-710L (L-Band) Demodulator

Description	Requirements
Frequency Range	950 MHz to 2150 MHz in 100 Hz steps
Impedance/Connector	50 Ω/Type N Female
Return Loss	10 dB
Input Power, Minimum	-58 + 10xLog(Symbol Rate in MHz) dBm, -58 dBm at 1 Msps, -41.5 dBm at 45 Msps
AGC Range	45 dB above minimum
Max Composite Level	+30 dBc composite to desired up to +10 dBm
Acquisition Range	± 100 kHz programmable in 1 kHz steps
Acquisition Time	Typical < 5 seconds, DVB-S and DVB-DSNG Typical < 10 seconds, DVB-S2 Pilots On
Adaptive Equalizer	Up to 3 dB tilt
BER Performance	See **Table 1-2** through **Table 1-5**.
IQ Test Point	Accessible from rear panel Alarm connector

Table 1-2. Eb/No Performance at Quasi Error Free PER = 10^{-7} with AWGN for DVB-S2 Operations
(FECFRAME = 64,800 or 16,200 Bits and no Pilot)

Modulation DVB-S2	Code Rate	Spectral Efficiency		Specified Es/No (dB) See Notes	Eb/No (dB) See Notes	Remarks
		FECFrame = 64,800 bits	FECFrame = 16,200 bits			
QPSK	1/4	0.490243	0.365324	-1.85	1.25	Information
	1/3	0.656448	0.629060	-0.74	1.09	Information
	2/5	0.789412	0.760928	0.20	1.23	Information
	1/2	0.988858	0.848840	1.50	1.55	
	3/5	1.188304	1.156532	2.73	1.98	
	2/3	1.322253	1.288400	3.60	2.39	
	3/4	1.487473	1.420269	4.53	2.81	
	4/5	1.587196	1.508181	5.18	3.17	
	5/6	1.654663	1.596093	5.68	3.49	
	8/9	1.766451	1.727961	6.70	4.23	
	9/10	1.788612	N/A	6.92	4.39	
8-PSK	3/5	1.779991	1.725319	6.20	3.70	
	2/3	1.980636	1.922040	7.32	4.35	
	3/4	2.228124	2.118761	8.61	5.13	
	5/6	2.478562	2.381056	10.15	6.21	
	8/9	2.646012	2.577778	11.49	7.26	
	9/10	2.679207	N/A	11.78	7.50	
16-APSK	2/3	2.637201	2.548792	9.97	5.76	
	3/4	2.966728	2.809662	11.21	6.49	
	4/5	3.165623	2.983575	12.03	7.03	
	5/6	3.300184	3.157488	12.61	7.42	
	8/9	3.523143	3.418357	13.89	8.42	
	9/10	3.567342	N/A	14.13	8.61	
32-APSK	3/4	3.703295	3.493093	13.73	8.04	
	4/5	3.951571	3.709309	14.64	8.67	
	5/6	4.119540	3.925526	15.28	9.13	
	8/9	4.397854	4.249850	16.69	10.26	
	9/10	4.453027	N/A	17.05	10.56	

Notes:

1. Eb/No = Es/No – 10 Log (Spectral Efficiency).
2. BER ≈ 10^{-9} at PER = 10^{-7}
3. Performance with FECFRAME = 16,200 Bits and no pilot is typically 0.2 to 0.3 dB higher.

Table 1-3. Eb/No Performance for DVB-S QPSK Operations

BER	Eb/No (dB)				
	1/2	2/3	3/4	5/6	7/8
10^{-6}	3.7	4.4	5.0	5.6	5.9
10^{-8}	4.0	4.7	5.3	5.9	6.3
10^{-11}	4.5	5.1	5.8	6.4	6.9

Table 1-4. Eb/No Performance for DSNG 8-PSK Operations

BER	Eb/No (dB)		
	2/3	5/6	8/9
10^{-4}	6.0	7.5	8.5
10^{-6}	6.3	7.9	8.8
10^{-8}	6.6	8.3	9.1
10^{-10}	6.9	8.8	9.4

Table 1-5. Eb/No Performance for DSNG 16-QAM Operations

BER	Eb/No (dB)	
	3/4	7/8
10^{-4}	8.1	10.0
10^{-6}	8.3	10.2
10^{-8}	8.6	10.4
10^{-10}	8.9	10.6

1.4.4 Test Functions

Description	Requirements
Data Test Pattern	2047 and 2^23-1 compatible with BERT on Tx data tributaries on applicable data interfaces
CW	Generates a narrow carrier at the programmed frequency at the programmed power level. Used in testing.
SSB Carrier	Provides desired sideband, suppressed carrier and suppressed sideband.
Loopback Modes	• Modulator to Demodulator • I/O Loopback where applicable • Digital Loopback where applicable

1.4.5 Monitor Functions

Description	Requirements
Status Items – available via Front Panel	Fault Log with fault type and time stamp
Receive Signal Level	Report within ± 5 dB, typical
Es/No	Report within ± 0.5 dB, typical
Eb/No	Report within ± 0.5 dB, typical

1.4.6 Remote Port Operation

Description	Requirements
Comtech EF Data Remote Port	See Appendix C. REMOTE CONTROL
Ethernet Telnet	Ethernet transport of standard Remote Control commands. See **Chapter 6. ETHERNET MANAGEMENT**.
Ethernet SNMP	See **Chapter 6. ETHERNET MANAGEMENT**.
Ethernet HTTP	Support all control and monitor parameters – See Chapter 6. ETHERNET MANAGEMENT

1.4.7 Data Rate Range

Symbol Rate and Data Rate Range for DVB-S2, DVB-S and DVB-DSNG. There is some roundoff in the data rate ranges in the last digit. **Table 1-6** is for the Standard FEC frame, and **Table** 1-7 is for the Short Frame. The tables are based on a 188-byte transport stream packet. When a 204-byte frame size is selected, the data rate increases by 204/188.

DVB recommends turning the Pilot **ON** for 8PSK and higher modulation orders, particularly when phase noise is present.

The following modes may need Pilot **ON** for low C/N operation: 8PSK 1/2, 16APSK 2/3 and 3/4, and 32APSK 3/4 to assist carrier recovery.

QPSK 1/4, 1/3, and 2/5 data is for information only.

Table 1-6. Data Rate Range: Standard FEC Frame (188 Byte Format)

Modulation	FEC Code	Inner Code Rate	Symbol Rate (Msps)		Spectral Efficiency Pilot OFF	Data Rate (Mbps) Pilot OFF		Spectral Efficiency Pilot ON	Data Rate (Mbps) Pilot ON	
			Min	Max		Min	Max		Min	Max
DVB-S2 - Standard FEC Frame = 64,800 Bits										
QPSK	LDPC+BCH	1/4	1	45	0.490243	0.490243	22.060942	0.478577	0.478577	21.535965
		1/3			0.656448	0.656448	29.540166	0.640827	0.640827	28.837209
		2/5			0.789412	0.789412	35.523546	0.770627	0.770627	34.678204
		1/2			0.988858	0.988858	44.498615	0.965327	0.965327	43.439697
		3/5			1.188304	1.188304	53.473684	1.160026	1.160026	52.201190
		2/3			1.322253	1.322253	59.501385	1.290788	1.290788	58.085452
		3/4			1.487473	1.487473	66.936288	1.452076	1.452076	65.343429
		4/5			1.587196	1.587196	71.423823	1.549426	1.549426	69.724175
		5/6			1.654663	1.654663	74.459834	1.615288	1.615288	72.687939
		8/9			1.766451	1.766451	79.490305	1.724416	1.724416	77.598702
		9/10			1.788612	1.788612	80.487535	1.746049	1.746049	78.572201
8PSK	LDPC+BCH	3/5	1	45	1.779991	1.779991	80.099585	1.739569	1.739569	78.280616
		2/3			1.980636	1.980636	89.128631	1.935658	1.935658	87.104623
		3/4			2.228124	2.228124	100.265560	2.177525	2.177525	97.988646
		5/6			2.478562	2.478562	111.535270	2.422276	2.422276	109.002433
		8/9			2.646012	2.646012	119.070539	2.585924	2.585924	116.366586
		9/10			2.679207	2.679207	120.564315	2.618365	2.618365	117.826440
16APSK	LDPC+BCH	2/3	1	35	2.637201	2.637201	92.302026	2.574613	2.574613	90.111471
		3/4			2.966728	2.966728	103.835482	2.896320	2.896320	101.371209
		4/5			3.165623	3.165623	110.796808	3.090495	3.090495	108.167326
		5/6			3.300184	3.300184	115.506446	3.221863	3.221863	112.765192
		8/9			3.523143	3.523143	123.310006	3.439530	3.439530	120.383555
		9/10			3.567342	3.567342	124.856967	3.482680	3.482680	121.893803
32APSK	LDPC+BCH	3/4	1	28	3.703295	3.703295	103.692261	3.623332	3.623332	101.453291
		4/5			3.951571	3.951571	110.643985	3.866247	3.866247	108.254911
		5/6			4.119540	4.119540	115.347126	4.030589	4.030589	112.856500
		8/9			4.397854	4.397854	123.139923	4.302894	4.302894	120.481032
		9/10			4.453027	4.453027	124.684751	4.356875	4.356875	121.992503
DVB-S & DVB-DSNG FEC Frame Does Not Apply										
QPSK	Conv+RS	1/2	1	45	0.921569	0.921569	41.470588	-	-	-
		2/3			1.228758	1.228758	55.294118	-	-	-
		3/4			1.382353	1.382353	62.205882	-	-	-
		5/6			1.535948	1.535948	69.117647	-	-	-
		7/8			1.612745	1.612745	72.573529	-	-	-
8-PSK	Conv+RS	2/3	1	45	1.843137	1.843137	82.941176	-	-	-
		5/6			2.303922	2.303922	103.676471	-	-	-
		8/9			2.457516	2.457516	110.588235	-	-	-
16-QAM	Conv+RS	3/4	1	45	2.764706	2.764706	124.411765	-	-	-
		7/8			3.225490	3.225490	145.147059	-	-	-

Table 1-7. Data Rate Range: Short Frame (188 Byte Format)

Modulation	FEC Code	Inner Code Rate	Symbol Rate (Msps)		Spectral Efficiency Pilot OFF	Data Rate (Mbps) Pilot OFF		Spectral Efficiency Pilot ON	Data Rate (Mbps) Pilot ON	
			Min	Max		Min	Max		Min	Max
DVB-S2 - Short FEC Frame = 16,200 Bits										
QPSK	LDPC+BCH	1/4	1	45	0.365324	0.365324	16.439560	0.357467	0.357467	16.086022
		1/3			0.629060	0.629060	28.307692	0.615532	0.615532	27.698925
		2/5			0.760928	0.760928	34.241758	0.744564	0.744564	33.505376
		1/2			0.848840	0.848840	38.197802	0.830585	0.830585	37.376344
		3/5			1.156532	1.156532	52.043956	1.131661	1.131661	50.924731
		2/3			1.288400	1.288400	57.978022	1.260693	1.260693	56.731183
		3/4			1.420269	1.420269	63.912088	1.389725	1.389725	62.537634
		4/5			1.508181	1.508181	67.868132	1.475747	1.475747	66.408602
		5/6			1.596093	1.596093	71.824176	1.561768	1.561768	70.279570
		8/9			1.727961	1.727961	77.758242	1.690800	1.690800	76.086022
		9/10			N/A	N/A	N/A	N/A	N/A	N/A
8PSK	LDPC+BCH	3/5	1	45	1.725319	1.725319	77.639344	1.692033	1.692033	76.141479
		2/3			1.922040	1.922040	86.491803	1.884959	1.884959	84.823151
		3/4			2.118761	2.118761	95.344262	2.077885	2.077885	93.504823
		5/6			2.381056	2.381056	107.147541	2.335120	2.335120	105.080386
		8/9			2.577778	2.577778	116.000000	2.528046	2.528046	113.762058
		9/10			N/A	N/A	N/A	N/A	N/A	N/A
16APSK	LDPC+BCH	2/3	1	35	2.548792	2.548792	89.207729	2.505223	2.505223	87.682811
		3/4			2.809662	2.809662	98.338164	2.761633	2.761633	96.657170
		4/5			2.983575	2.983575	104.425121	2.932574	2.932574	102.640076
		5/6			3.157488	3.157488	110.512077	3.103514	3.103514	108.622982
		8/9			3.418357	3.418357	119.642512	3.359924	3.359924	117.597341
		9/10			N/A	N/A	N/A	N/A	N/A	N/A
32APSK	LDPC+BCH	3/4	1	28	3.493093	3.493093	97.806607	3.419165	3.419165	95.736626
		4/5			3.709309	3.709309	103.860661	3.630805	3.630805	101.662551
		5/6			3.925526	3.925526	109.914715	3.842446	3.842446	107.588477
		8/9			4.249850	4.249850	118.995796	4.159906	4.159906	116.477366
		9/10			N/A	N/A	N/A	N/A	N/A	N/A

Chapter 2. INSTALLATION

2.1 Unpacking and Inspection

The CDM-710 Broadcast Satellite Modem and its Installation and Operation Manual are packaged in a pre-formed, reusable, cardboard carton containing foam spacing for maximum shipping protection.

Be sure to keep all shipping materials for the carrier's inspection.

Inspect shipping containers for damage. If are damaged, keep the containers until the contents of the shipment have been carefully inspected and checked for normal operation.

Do not use any cutting tool that will extend more than 1" into the container and cause damage to the unit.

Unpack and inspect the modem as follows:

Step	Description
1	Cut the tape at the top of the carton indicated by **"OPEN THIS END."**
2	Remove the cardboard/foam space covering the modem.
3	Remove the modem, manual, and power cord from the carton.
4	Save the packing material for storage or reshipment purposes.
5	Inspect the equipment for any possible damage incurred during shipment.
6	Check the equipment against the packing list to ensure the shipment is correct.
7	Refer to the following sections for further installation instructions.

2.2 Mounting

If the CDM-710 is to be mounted in a rack, ensure that there is adequate clearance for ventilation, particularly at the sides. In rack system where there is high heat dissipation, forced air-cooling must be provided by top or bottom mounted fans or blowers. Under no circumstances should the highest internal rack temperature be allowed to exceed 50°C (122°F).

2.2.1 Method A: Optional Rear-Mounting Support Brackets

Figure 2-1 depicts rack-mounting using the optional CEFD P/N KT/6228-2 Rear-Mounting Support Brackets kit:

Optional Rear-Mounting Support Brackets Kit KT/6228-2		
Quantity	**CEFD Part Number**	**Description**
2	HW/10-32SHLDR	Screw, #10 Shoulder
4	HW/10-32FLT	Washer, #10 Flat
2	HW/10-32SPLIT	Washer, #10 Split
2	HW/10-32HEXNUT	Nut, #10 Hex
2	FP/6138-1	Bracket, Rear Support
4	HW/10-32x1/2RK	Bolt, #10 Rack Bracket

The tools required for this installation are a **medium Phillips™ screwdriver** and a **5/32-inch SAE Allen™ Wrench.** The kit is installed as follows:

Step	Description
1	Secure the #10 shoulder screws to the unit chassis through the rear right and left side mounting slots, using the #10 flat washers, #10 split washers, and #10 hex nuts as shown.
2	Install the rear support brackets onto the equipment rack threaded rear mounting rails, using the #10 rack bracket bolts.
3	Mount the unit into the equipment rack, ensuring that the shoulders of the #10 shoulder screws properly engage into the rear support bracket slots.

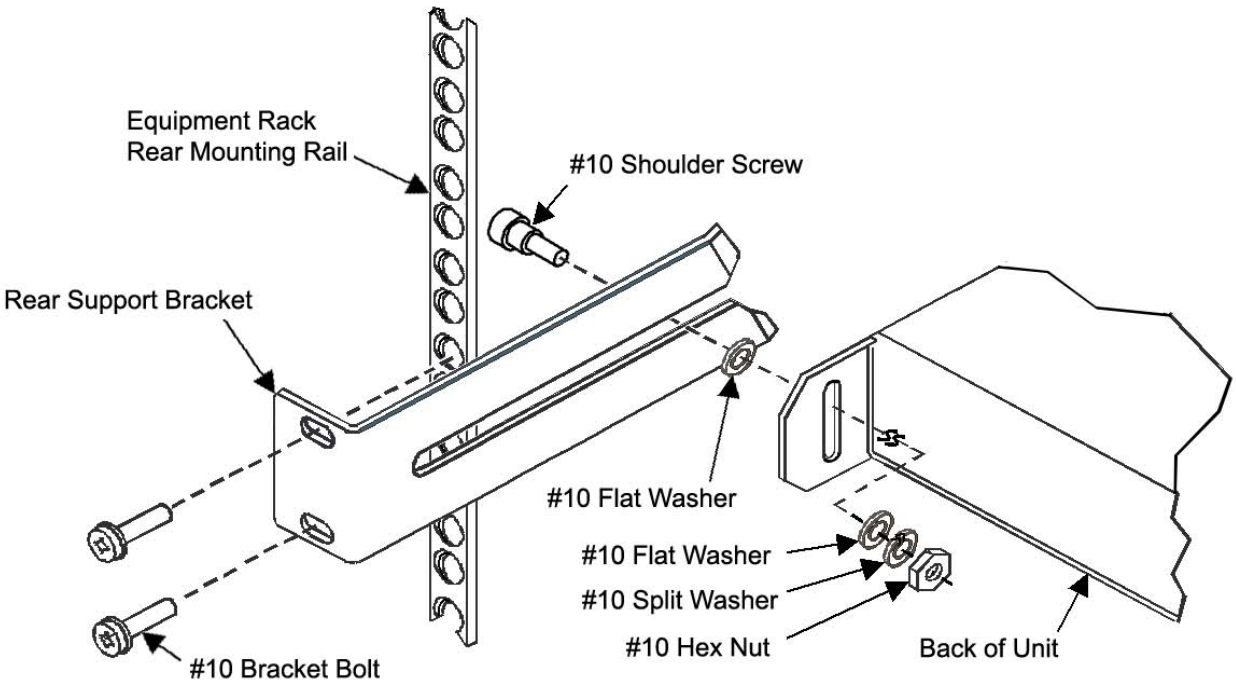
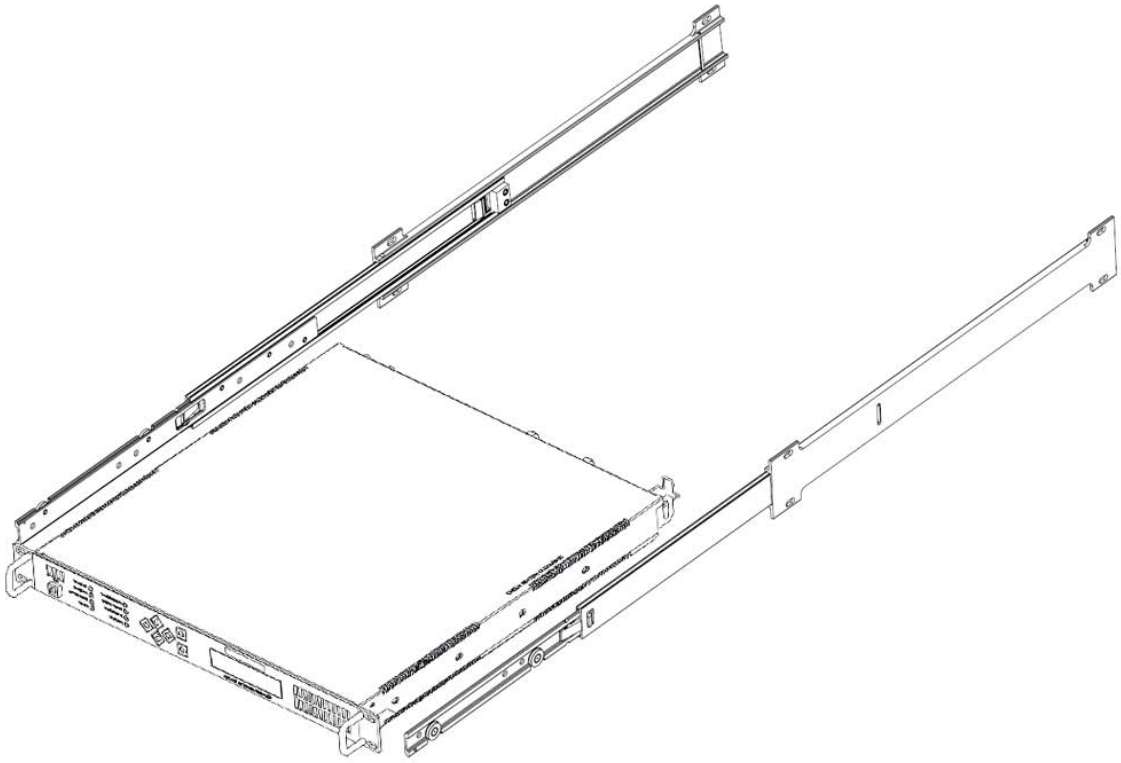


Figure 2-1. Installation of Optional Rear-Mounting Support Brackets (KT/6228-2)

2.2.2 Method B: Optional Bearingless Side-Railings

Figure 2-2 depicts rack-mounting via use of the optional CEFD P/N FP/SL0006 Bearingless Side-Railings, installed using user-furnished standard shop tooling and mounting hardware:



Optional Bearingless Side-Railings (CEFD P/N FP/SL0006)		
Quantity	**CEFD Part Number**	**Description**
2	FP/SL0006	Bearingless Side-Railing

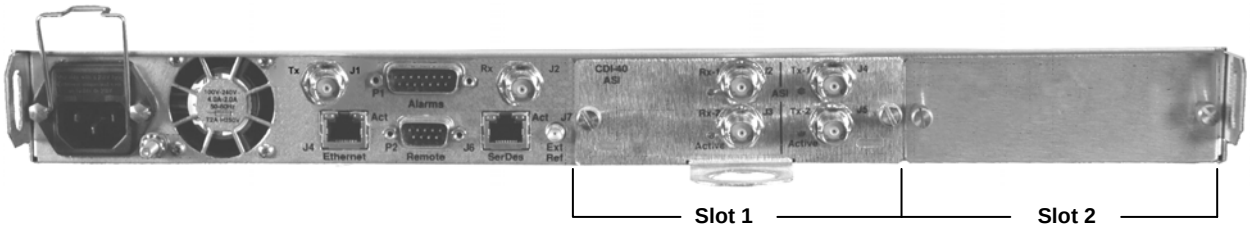
Figure 2-2. Installation of Optional Bearingless Side-Railings (FP/SL0006)

Chapter 3. REAR PANEL CONNECTORS AND PINOUTS

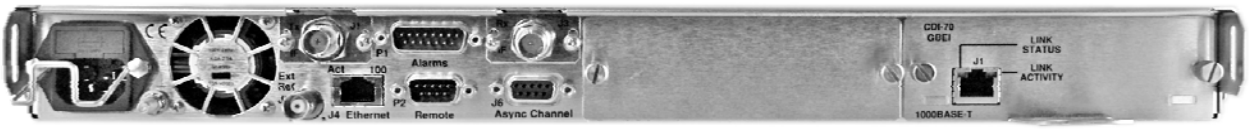
3.1 Overview

The CDM-710 Broadcast Satellite Modem rear panel connectors, shown in **Figure 3-1**, provide all necessary external connections between the modem and other equipment.

On the next page, **Table 3-1** summarizes the available connectors, grouped according to service function, and the differences between the initially released chassis and the Rev. A and later chassis. Refer to the applicable Data Interface sections later in this chapter for pertinent connector pinout information.



Initially released chassis (70/140 MHz shown with optional CDI-40 ASI interface)



Rev. A and later chassis (70/140 MHz shown with optional CDI-70 Gigabit Ethernet interface)

Figure 3-1. Rear Panel View

Table 3-1. Modem Rear Panel Connectors

Connector Group	Ref Des / Name	Connector Type	Function
IF Sect. 3.2	J1 Tx	CDM-710 (70/140 MHz band): BNC female	IF Output
		CDM-710L (L-Band): Type 'N' female	
	J3 Rx	CDM-710 (70/140 MHz band): BNC female	IF Input
		CDM-710L (L-Band): Type 'N' female	
Terrestrial Data Sect. 3.3	J4 Ethernet	RJ-45 Female	10/100 BaseT Remote Interface
	J6 SerDes *(Initially-released chassis only Note 1)*	RJ-45 Female	Private communications link
	J6 Async Channel *(non-operational)* *(Rev A and later chassis only Note 2)*	9-pin Type 'D' female	Asynchronous Engineering Channel
Utility Sect. 3.4	P1 Alarms	15-pin Type 'D' male	Form C Alarms (relay closures)
	P2 Remote	9-pin Type 'D' male	Serial Remote Interface (RS232/485)
	J7 Ext Ref *(Initially-released chassis only Note 1)*	SMA Female	External Reference Input
	J7 Ext Ref *(Rev A and later chassis only Note 2)*	BNC female	External Reference Input
Power/Ground Sect. 3.5	AC	IEC	Chassis prime power input
	DC (Optional)	Terminal block	Chassis prime power input
	Ground	#10-32 stud	Common Chassis Ground

Notes:

1. The **initially released chassis** is *Tx only* and does *not* support 1:1 operation. It does not support 1:N operation and is not upgradeable. This chassis is also not upgradeable to Rx only or duplex operation.
2. The **Rev. A and later chassis** is *required* for 1:1 or 1:N operation. It supports Tx Only, Rx Only, and Duplex operation

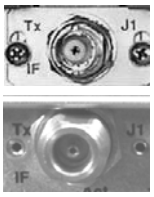
The European EMC Directive (EN55022, EN50082-1) requires using properly shielded cables for DATA I/O. These cables are double-shielded from end-to-end, ensuring a continuous ground shield.

3.2 IF (J1 Tx / J3Rx) Connections

CAUTION

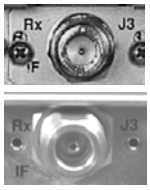
There may be DC voltages present on the CDM-710L (L-Band) Type 'N' Rx and Tx IF connectors, up to a maximum of 48 volts.

3.2.1 Tx IF Connectors, J1



Ref Des	Connector Type	Description	Direction
J1	**CDM-710 (70/140 MHz band):** BNC female	70/140 MHz Tx IF signal	Out
	CDM-710L (L-Band): Type 'N' female	L-Band Tx IF signal	

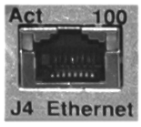
3.2.2 Rx IF Connectors, J3



Ref Des	Connector Type	Description	Direction
J2	**CDM-710 (70/140 MHz band):** BNC female	70/140 MHz Rx IF Signal	In
	CDM-710L (L-Band): Type 'N' female	L-Band Rx IF Signal	

3.3 Terrestrial Data Connections

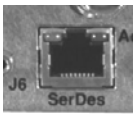
3.3.1 10/100 Ethernet Remote Port Connector Pinout, J4



The J4 Ethernet connector is a RJ-45 female interface. The J4 connector pinout is as follows:

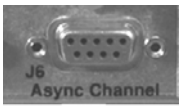
Pin #	Description	Direction
1	Tx+	Out
2	Tx-	Out
3	Rx+	In
4	N/A	
5	N/A	
6	Rx-	In
7	N/A	
8	N/A	

3.3.2 SerDes Port Connector, J6 (Initially released chassis only)



RJ-45: Private communications link – not available for customer use.

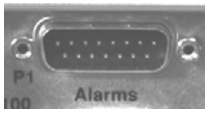
3.3.3 ASYNC Port Connector Pinout, J6 (Rev. A and later chassis, *non-operational*)



At present, Asynchronous Engineering Channel operation is not implemented in the CDM-710/710L; this connection is therefore *non-operational*.

3.4 Utility Connections

3.4.1 Alarms Connector, P1



The P1 Alarms connector is a 15-Pin Type 'D' male (DB-9M) interface with threaded jack nuts. The pinout depends upon whether the unit is in the Normal or Redundancy mode for use with the CRS-170A (L-Band) 1:1, CRS-180 (70/140 MHz) 1:1, or CRS-300 1:N redundancy switches. The unit is put into 1:1 mode under the **Config: AUX → 1:1 Mask → Ena/Dis** menu by selecting **Enable**. The connector pinout is as follows:

P1 Alarms Connector Pinout – Normal Mode				
Pin #	Description		Name	Direction
8	Rx Traffic (De-energized, Faulted)	Note 1, 2	Rx-NC	I/O
15	Rx Traffic (Energized, No Fault)		Rx-NO	I/O
7	Rx Traffic		Rx-COM	I/O
14	Tx Traffic (De-energized, Faulted)	Note 1, 2	Tx-NC	I/O
6	Tx Traffic (Energized, No Fault)		Tx-NO	I/O
13	Tx Traffic		Tx-COM	I/O
5	Unit Fault (De-energized, Faulted)	Note 1, 2	Unit-NC	I/O
12	Unit Fault (Energized, No Fault)		Unit-NO	I/O
4	Unit Fault		Unit-Com	I/O
11	Rx I Channel (Constellation Monitor)		Rx-I	O
3	Rx Q Channel (Constellation Monitor)		Rx-Q	O
10	No Connection		NC	NC
2	AGC Voltage (Rx signal level, 0-10 volts)		AGC	O
9	Ext Carrier Off (TTL Lo = Mute, Open = Tx)		EXT-OFF	I
1	Ground		GND	Gnd

P1 Alarms Connector Pinout – 1:N (CRS-300) *and* 1:1 Mode (CRS-170A, CRS-180)				
Pin #	Description		Name	Direction
8	Summary Relay NC (De-energized, Faulted)		PR-NC, *	I/O
15	Summary Relay NO (Energized, No Fault)		PR-NO	I/O
7	Summary Relay COM	Note 1, 2	PR-COM	I/O
14	Clock Detect		Clk Det	I
6	Aux Tx Enable		Red_Out_4	O
13	No Connection		NC	NC
5	Fused -12 VDC Output (160 mA max)		-12VDC	O
12	Fused +12 VDC Output (160 mA max)		+12VDC	O
4	Online		Red_In_2	I
11	Serial Clock		Red_Out_1	O
3	Serial Data		Red_Out_2	O
10	Receive Serial Data – auxiliary channel		Red_In_3	I
2	Transmit Serial Data – auxiliary channel		Red_Out_3	O
9	Ext Carrier Off (TTL Lo = Mute, Open = Tx)		Red_In_1	I
1	Ground		GND	Gnd

P1 Notes :

1. The relays have low voltage contacts with transient suppressors across each pin to ground. The Summary Relay combines Tx, Rx, and Unit Faults into a single relay.
2. The maximum working voltage is 18VDC or 13VAC. The maximum current rating is 1 Amp DC or 0.5 Amp AC.

3.4.2 Remote Port Connector (RS-232/-485), P2

The P2 Remote port connector is a 9-pin Type 'D' male (DB-9M) interface with threaded jack nuts. It is intended for connection to an M&C computer or terminal device, and is user selectable for either RS-232 or RS-485.The connector pinout is as follows:

Pin #	Description	Direction
1	Ground	-
2	RS-232 Transmit Data	Out
3	RS-232 Receive Data	In
4	Not Used	-
5	Not Used	-
6	RS-485 Receive Data B *	In
7	RS-485 Receive Data A *	In
8	RS-485 Transmit Data B	Out
9	RS-485 Transmit Data A	Out

* Use for 2-wire RS-485 operation

3.4.3 External Reference Input, J7

The Ext Ref (External Reference) input is used to supply a master reference to the entire chassis. The clocks on the Framer Card and the Modulator and Demodulator Synthesizers are locked to this input, when it is used. Note that some data interfaces have an Ext-Clk input for synchronizing the data sources. Observe the following:

Initially released chassis: SMA Female connector

Rev. A and later chassis: BNC Female connector

3.5 Power/Ground Connectors

3.5.1 AC Power Connector

A standard, detachable, non-locking, 3-prong power cord (IEC plug) supplies the Alternating Current (AC) power to the modem. Observe the following:

Input Power	60W maximum
Input Voltage	100 to 240V AC 50/60Hz auto-ranging (unit switches ranges automatically)
Connector Type	I.E.C
Fuse Protection	Line and neutral fusing. For 115 and 230 volt AC operation, use T2.00A 20mm fuses. **Note:** For 48 VDC operation, use T6.25A, 6.3x32mm fuses.

3.5.2 Ground Connector (GND)

A #10-32 stud on the rear panel of the modem is used for connecting a common chassis ground among all equipment.

Note: The AC power connector provides the safety ground.

Chapter 4. FLASH UPGRADING

4.1 Flash Upgrading via Internet

The CDM-710 Broadcast Satellite Modem eliminates the need for updating firmware by physically replacing EPROMs. Instead, the CDM-710 uses 'Flash memory' technology internally. This makes software upgrading very simple, and updates can now be sent via the Internet using www.comtechefdata.com (Comtech EF Data's Web site, **Figure 5-1**), via e-mail, or on CD.

This chapter outlines the complete upgrading process as follows:

- New firmware can be downloaded via the Internet to an external PC.
- The upgrade can be performed without opening the CDM-710 by simply connecting the unit to the Ethernet port of the external PC.
- Once downloaded, the firmware update is transferred via **F**ile **T**ransfer **P**rotocol (FTP) to the CDM-710; the update is then activated upon modem reboot.

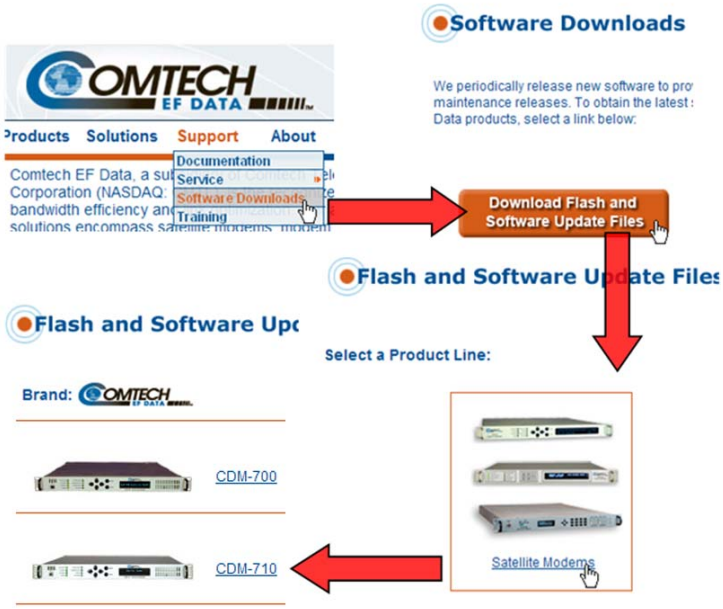


Figure 5-1. Flash Update via Internet

4.2 CDM-710 Broadcast Satellite Modem Flash Upgrade Restrictions

IMPORTANT

The upgrade to FW12437x Firmware Ver. 4.0.x from an earlier version is a one way upgrade path. Once an upgrade to 4.0.1 (or higher) is completed, it is no longer possible to revert to earlier versions – if reflash to an earlier version is attempted the modem will detect and disallow it as a protective measure.

The one-way upgrade effect is necessary because reallocation of internal memory for additional space has resulted in an incompatibility between releases beginning with Firmware Ver. 4.0.1 and all earlier versions.

Note the following:

- Use the flash upgrading steps provided on this page when either:
  - Upgrading to Firmware Ver. 4.1.1 or later ***from a firmware version prior to Ver. 4.0.1***, first upgrade to Ver. 4.0.1 in both images *prior to upgrading to Ver. 4.1.1*,

    –or–

  - Upgrading to/from Firmware Ver. 4.1.1 or later ***from an earlier version***.

Upgrading to Firmware Ver. 4.1.1 from a previous version	
Step	**Procedure**
1	Start with pre-FW Ver. 4.1.1 in both images.
2	Upgrade one image.
3	Switch images.
4	Reboot the modem.
5	Upgrade the opposite image.
6	Reboot the modem.
7	Switch images.
8	Reboot the modem once more.

Downgrading from Firmware Ver. 4.1.1 to a previous version	
Step	**Procedure**
1	Must start with FW Ver. 4.1.1 or later in both images.
2	Program the lower version of firmware into one of the images.
3	PRIOR TO REBOOTING, switch to the other image.
4	Reboot the modem.
5	Program the lower version into the opposite image.
NOTE	If the modem is rebooted without switching images per Step 3, simply put both images back to the higher version and start over.

- Upgrading from Firmware Ver. 4.1.1 to 4.1.2 uses the Bulk Firmware Upgrade procedure outlined in the next chapter section.

4.3 Bulk Firmware Upgrade – Ethernet FTP Upload Procedure

Step	Procedure
1	**Identify the re-flashable product, firmware number, and version for download.** The current modem M&C version can be viewed at the top-level menu of the front panel display (press the **[CLR]** key several times to view). The firmware information can also be found within the **SELECT: UTIL → Firmware → Info → Image#1** *or* **Image#2** menu trees. Using serial remote control, the firmware revision levels may be obtained with the **<0/SWR?** query. For more information, refer to **Appendix A. REMOTE CONTROL.** **Alternately,** when using the HTTP Interface, the Bootrom, Bulk1 and Bulk2 firmware loads may be viewed after selecting the **Unit Info** hyperlink, available from the **Maint** (Maintenance) page tab. For more information, refer to **Chapter 6. WEB SERVER INTERFACE**.
2	**Create a temporary folder** (directory) on an external PC: • ***For Windows Explorer:*** Select **File > New > Folder** to create a new folder, then rename it from "**New Folder**" to "**temp**" or another convenient, unused name. Assuming "**temp**" works, a "***c:\temp***" folder should now be created. **Note:** The drive letter **c:** is used in this example. Any valid writable drive letter can be used. • ***For Windows Command-line:*** Click **[Start]** on the Windows taskbar, then click the "**Run...**" icon (or, depending on Windows OS versions *prior* to Windows 95, click the "**MS-DOS Prompt**" icon from the Main Menu). Then, to open a Command-line window… o ***For Windows 95 or Windows 98*** – Type "**command**". o ***For any Windows OS versions later than Windows 98*** – Type "**cmd**" *or* "**command**". ***Alternately,*** from **[Start],** select ***All Programs > Accessories > Command Prompt***. At the Command-line prompt (c:\>), type "**mkdir temp**" or "**md temp**" (without quotes – **mkdir** and **md** stand for *make directory*). This is the same as creating a new folder using Windows Explorer. There should now be a "***c:\temp***" subdirectory created (where **c:** is the drive letter used in this example).
3	**Download the correct firmware file** to this temporary folder. As shown in **Figure 4-1**: a) **Go online** to: www.comtechefdata.com; b) From the ***Home page*** menu bar, **click** the ***Support*** tab; c) **Click** the ***Software Downloads*** drop-down *or* hyperlink from the ***Support*** page; d) **Click** the ***Download Flash and Software Update Files*** icon; e) **Click** the ***(Select a Product Line:) Satellite Modems*** hyperlink provided on the ***Flash and Software Update Files*** page; f) **Select** the **CDM-710** product hyperlink from the ***Comtech Brand*** column; **Select** the appropriate firmware hyperlink.

3 (cont)	**About Firmware Numbers, File Versions, and Formats:** The flashable files on the download server are organized by product prefix (i.e., FW – Firmware). The base modem bulk firmware for the CDM-710 is **FW12437x_V###** (where 'x' denotes the revision letter of the bulk modem firmware, and V### represents the firmware version), applicable for units with the Rev A. or later chassis (FW Ver 2.1.1 or later); for initially-released chassis (with the membrane overly switch assembly, FW Ver. 1.1.3 or earlier), the based modem bulk firmware number is **FW12050x_V###**. The current version firmware release is provided. If applicable, one version prior to the current release is also available. Be sure to identify and download the desired version. The downloadable files are stored in two formats: *.exe (self-extracting) and *.zip (compressed). Some firewalls will not allow the downloading of *.exe files. In this case, download the *.zip file instead. For additional help with "zipped" file types, refer to *PKZIP for Windows*, *WinZip*, or *ZipCentral* help files. *PKZIP for DOS* is not supported due to file naming conventions.
4	**Extract the files** to the temporary folder on the PC. A minimum of two files should be extracted: 1. **FW12437x.bin**, where "x" denotes the revision letter for the bulk image file. 2. **ReleaseNotes_CDM710_v###.pdf**, where "###" denotes the firmware release version number .
5	**Confirm that the files have been extracted** to the specified temporary folder on the PC. Using Command-line, type **cd c:\temp** to change to the temporary directory created in ***Step 2***, then use the **dir** command to list the files extracted from the downloaded archive file.
6	**Connect** the client PC to the CDM-710's 10/100 Ethernet M&C via a hub or a switch, or directly to the PC with a crossover cable. IMPORTANT ***BASE MODEM firmware can only be loaded via the Ethernet M&C port; do not use the Ethernet Traffic port.***
7	**Send a "ping" command** to the modem to verify the connection and communication. *First,* determine the IP address of the modem remotely or by using the modem front panel: • **Via Remote Control** , use the **<000/IPA?** query. • **Via the modem front panel:** **SELECT: CONFIG → Remote → Remote → Ethernet** menu. *Then,* using Command-line to "ping" the modem – at the prompt, type "**ping *www.xxx.yyy.zzz***" (where '***www.xxx.yyy.zzz***' is the IP address of the modem). The results should confirm whether or not the modem is connected and communicating.
8	**Initiate an FTP session** with the modem. Using Command-line: a) From the PC, at the prompt type "**ftp *www.xxx.yyy.zzz***" where "***www.xxx.yyy.zzz***" is the IP address of the base modem. b) Enter the **Admin User Name** (there will be no prompt for a password) to complete login. c) Verify the FTP transfer is binary by typing "**bin**". d) Type "**prompt**", then type "**hash**" to facilitate the file transfers.
9	**Transfer the files** from the temporary folder on the PC: Type "**put FW12437x.bin bulk:**" to begin the file transfer. The destination "**bulk:**" must be all lower-case.

9 (cont)	The process sequences through several blocks – this will take several minutes.
	`Programming flash sector #xx`
	`Please wait…`
	
	• ***Stopping the FTP before the "PROGRAMMING FLASH SECTOR#xx PLEASE WAIT" messaging sequence is complete could lead to an incomplete download, and will require a repeat of Step 9.***
	• ***The user must reflash both images with the same firmware version for the unit to function properly.***
	• ***The upgrade from an earlier version to 4.x.x is a one-way upgrade path. Once an upgrade to 4.0.1 is completed it is no longer possible to revert to earlier versions. If reflash to an earlier version is attempted, the modem will detect and disallow it as a protective measure. The unit will also disallow an attempt to switch to an image with an earlier version of firmware.***

10	**Verify the file transfer:** The PC should report that the file transfer has occurred, and the display on the modem will report: `Bulk FTP done. Press CLEAR.`
11	**Terminate the FTP session:** Type "**bye**" and close the Command-line window.
12	Confirm that the new file was loaded by using the procedure in ***Step 1***.
13	**Change the desired image to boot**. From the CDM-710 front panel menu: **SELECT: UTIL → Firmware → Select** (*use ◄ ► arrows to change to the other image)*, then cycle power to reboot the modem.

14	**Verify the new firmware has booted** by observing the Firmware Version displayed on the modem front panel VFD (Video Fluorescent Display):
	`CDM-710 Modem`
	`Firmware Version: #.#.#`
	Note: To load the second image, repeat ***Steps 8*** through ***11***.

4.4 10/100/1000 BASE-T (GigE) INTERFACE (CDI-70) FTP Upload Procedure

If a CDI-70 10/100/1000 Base-T Gigabit Ethernet Interface is used, a CDM-710/710L modem running Firmware Ver. 4.1.6 requires a CDI-70 Interface running Firmware Ver. 1.1.2 or higher. Refer to **Chapter 10. 10/100/1000 BASE-T (GigE) INTERFACE (CDI-70)** for information on and instructions for flash upgrading this optional data interface.

4.5 USB Procedure

USB reflash is not available in this firmware release – please consult Comtech EF Data Customer Support for release schedule.

Notes:

Chapter 5. FRONT PANEL OPERATION

5.1 Introduction

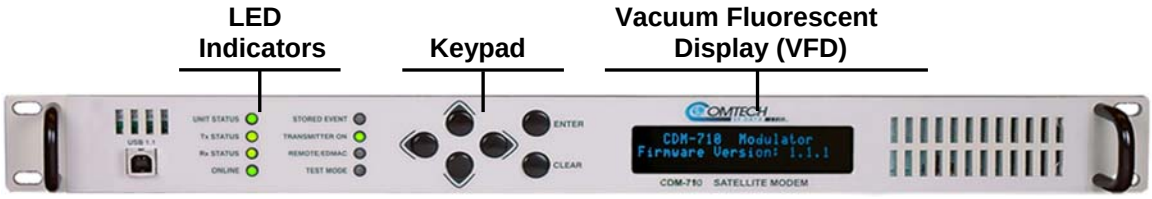
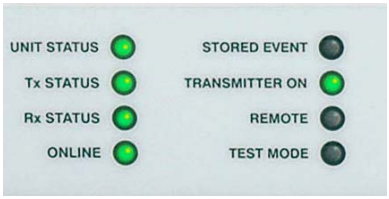


Figure 5-1. CDM-710 Front Panel View (Rev. A and later, L-Band version shown)

Figure 5-1 identifies the key features of the CDM-710 Broadcast Satellite Modem front panel.

The user can fully control and monitor the operation of the CDM-710 using the front panel's LED indicators, keypad, and display. The CDM-710 features a nested menu system that displays all available options and prompts the user to carry out a required action.

5.1.1 Front Panel LED Indicators



IMPORTANT

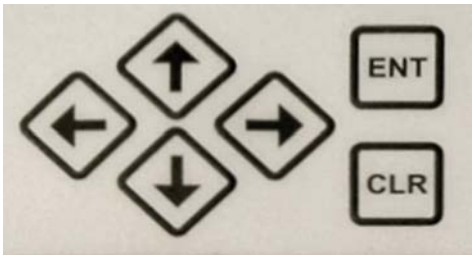
In general, the Alarm relay state will reflect the state of the Front Panel LEDs. For instance, if the Unit Status LED is red, the Unit Alarm relay will be active, etc. The one exception is the Transmit Traffic relay; this will only be activated if a Transmit Traffic Fault exists – it does not reflect the state of the Tx carrier.

The behavior of the eight front panel LEDs adjacent to the keypad indicate the operation status of the CDM-710, and are described as follows:

LED	COLOR	CONDITION/STATE
UNIT STATUS	Green	No Unit Faults or Alarms exists.
	Orange	A Unit Alarm exists.
	Red	A Unit Fault exists.
Tx STATUS	Green	No Tx Traffic Faults or Alarms exists.
	Orange	A Tx Traffic Alarm exists.
	Red	A Traffic Fault exists.
	Off	Unit not configured for Modulator.
Rx STATUS	Green	No Rx Traffic Faults or Alarms exists.
	Orange	An Rx Traffic Alarm exists.
	Red	An Rx Fault exists.
	Off	Unit not configured for Demodulator.
ONLINE	Green	The Unit is On Line, and carrying traffic
	Off	The Unit is Off Line (standby) – forced by externally connected 1:1 or 1:N redundancy system
STORED EVENT	Orange	There is a Stored Event in the log that may either be viewed from the front panel or retrieved via the remote control interface.
	Off	There are no Stored Events.
TRANSMITTER ON	Green	Transmitter is currently on. This indicator reflects the actual condition of the transmitter, as opposed to the programmed condition.
	Off	Transmitter is currently OFF.
REMOTE	Green	The Unit is in Remote Communication Mode. Local monitoring is possible, but no local control.
	Off	The Unit is in Local Mode – remote monitoring is possible, but no remote control.
TEST MODE	Green	A Test Mode is selected; e.g., IF Loopback.
	Off	There is no Test Mode currently selected.

5.1.2 Front Panel Keypad

The keypad is shown in **Figure 5-2**:



**"Diamond" Keypad:
Initially Released Chassis**

**Button Keypad:
Rev. A or Later Chassis**

Figure 5-2. Keypad

The keypad features six individual key switches with a positive 'click' action – this provides the user with tactile feedback. The function of these keys is as follows:

ENTER [ENT]	ENTER [ENT] is used to select a displayed function or to execute a modem configuration change.
CLEAR [CLR]	CLEAR [CLR] is used to back out of a selection or to cancel a configuration change that has not been executed using ENTER [ENT]. Pressing CLEAR [CLR] generally returns the display to the previous selection.
(Left, Right) ◀ ▶ [←] [→]	These arrows are used to move to the next selection or to move the cursor functions. At times, they may also used to move from one section to another.
(Up, Down) ▲ ▼ [↑] [↓]	These arrows are used primarily to change configuration data (characters or numbers). At times, they may also be used to move from one menu section to another.

IMPORTANT

The keypad has an auto-repeat feature. If a key is held down for more than 1 second, the key action will repeat, automatically, at the rate of 15 keystrokes per second. This is particularly useful when editing numeric fields, with many digits, such as frequency or data rate.

5.1.3 Front Panel Vacuum Fluorescent Display (VFD)

The CDM-710 features a **V**acuum **F**luorescent **D**isplay (VFD). The VFD is an active display showing two lines of 24 characters each. It produces a blue light, the brightness of which can be controlled by the user. Compared to a **L**iquid **C**rystal **D**isplay (LCD), it has greatly superior viewing characteristics and does not suffer problems of viewing angle or contrast.

5.2 Opening Screen

The opening 'welcome screen' shown here is representative of what displays whenever power is first applied to the unit (the Firmware Version may differ). Pressing any key takes the user to the top-level **Select** menu.

IMPORTANT

For purposes of this documentation, a CDM-710 (70/140 MHz) unit is shown; the unit in use could be either a CDM-710 70/140 MHz or CDM-710L L-Band Broadcast Satellite Modem.

As shown above, the 'welcome screen' is displayed whenever power is first applied to the unit. The top line identifies the unit model (i.e., CDM-710 as shown, or CDM-710L); the bottom line displays the CDM-710's installed Firmware Version (version number varies).

Pressing any key takes the user to the top-level Select menu. On most menu screens, users will see a flashing, solid-block cursor that blinks at a once-per-second rate. This indicates the currently selected item, digit, or field:

```
CONFIG: Remote  Tx  Rx
Int1 Int2 Ref Aux Alarms
```

Where this solid block cursor would obscure the item being edited (e.g., a numeric field), the cursor will automatically change to an underline cursor:

```
Tx Freq: 0140.0000 MHz
          (◄ ► ▲ ▼ ENTER)
```

To prevent the display from becoming burnt by a constant image, the unit employs a screen saver feature that activates after one hour and constantly scrolls and wraps a message across the screen. The top line of the screen saver display shows the Circuit ID, which is user-configurable; the bottom line displays the message '**Press any key…**' as shown:

```
   Circuit ID:--------------
---Press any key...
```

Press any key to restore the previously active screen.

5.2.1 Menu Matrix

Sect.	Description	Remarks
5.2	Opening Screen	
5.3	Select (Main) Menu	*Select:* Config; Monitor; Test; Info; Save/Load; Util
5.3.1	Configuration	*Select:* Remote; Tx; Rx: Int1; Int2; Ref; Aux; Alarms
5.3.1.1	(CONFIG:) Remote Control	*Select:* Local; Serial; Ethernet; Ser+Eth
0	(CONFIG:) Tx	*Select:* FEC; Mod; Code; SymRate; Mode; Freq; Pwr; Scram
5.3.1.3	(CONFIG:) Rx	*Select:* FEC; Dem; Code; SymRate; Mode; Freq; Eb/No; PLL
5.3.1.4	(CONFIG:) Intfc1 (CDI-40 ASI Interface only)	*Select:* Tx; Rx; Config
5.3.1.5	(CONFIG:) Intfc1 (CDI-60 HSSI Interface only)	*Select:* Tx; Rx; CTS/RTS
5.3.1.6	(CONFIG:) Intfc2 (CDI-70 Gigabit Ethernet Interface only)	*Select:* Ingress; Egress; Man; Stats
5.3.1.7	(CONFIG:) Ref	
5.3.1.8	(CONFIG:) Aux	*Select:* Ena/Dis; Force (1:1)
5.3.1.9	(CONFIG:) Alarms	*Select:* Tx; Intfc1; Intfc2
5.3.2	Monitor	*Select:* Alarms; Rx Stats; Event-Log
5.3.2.1	(Monitor:) Alarms	*Select:* Transmit; Receive; Unit
5.3.2.2	(Monitor:) Rx Stats	
5.3.2.3	(Monitor:) Event-Log	*Select:* View; Clear-All
5.3.3	Test	*Select:* Mode; TestPatterns
5.3.4	Info	*Select:* Rem; Tx; Rx; Intfc1; Intfc2
5.3.5	Save/Load	*Select:* Save; Load
5.3.5.1	(Save/Load:) Save	
5.3.5.2	(Save/Load:) Load	
5.3.6	Utility	*Select:* RT-CLK; Ref; ID; Display; Firmware; FAST
5.3.6.1	(Utility:) RT-Clk	
5.3.6.2	(Utility:) Ref	
5.3.6.3	(Utility:) ID	
5.3.6.4	(Utility:) Display	
5.3.6.5	(Utility:) Firmware	*Select:* Info; Select
5.3.6.6	(Utility:) FAST	*Select:* Cnfg; View

Notes:

1. The **CONFIG: Tx → Pwr → Imp** (Impedance) selection appears only when the 70/140 MHz Modulator card is installed.
2. Refer to **CONFIG: Tx → SymRate** for the Data Rate table.
3. *The following **CONFIG:** submenus are available **only** when the Mode selection is **DVB-S2**:*

   Tx → Scram; **Tx → Mod → Pilot**; **Tx → Mod → Frame**; **Rx → Dem → Pilot**; and **Rx → Dem → Scr**.

5.3 SELECT: (Main) Menu

```
SELECT: Config  Monitor
Test Info Save/Load Util
```

Move the cursor to the desired choice using the ◄ ► arrow keys, then press **ENTER**. The following table describes the function of each menu branch (along with the section in this chapter that provides information on that branch and its accompanying submenus):

SELECTION	Sect	MENU BRANCH DESCRIPTION
Config	5.3.1	(Configuration) Provides the user selections for the desired Interface, Transmit, and Receive operations.
Monitor	5.3.2	Permits the user to monitor the alarm status of the unit, to view the log of stored events, and to display the Receive Parameters screen.
Test	5.3.3	Permits the user to configure the modem into one of several Test modes; e.g., CW and Loopback.
Info	5.3.4	(Information) Provides a summary/display of the Interface, Transmit, Receive, and M&C configurations.
Save/Load	5.3.5	Permits the user to save and retrieve up to 10 different modem configurations.
Util	5.3.6	(Utility) Permits the user to perform miscellaneous functions, such as setting the Real-Time Clock, adjusting the display brightness, etc.

5.3.1 SELECT: Config

```
CONFIG: Remote Tx Rx
Int1 Int2 Ref Aux Alarms
```

Select a submenu from the **CONFIG:** menu branch using the ◄ ► arrow keys, then press **ENTER**. The available submenus are:

SELECTION	SECT	SUBMENU DESCRIPTION
Remote	5.3.1.1	(Remote Control) Permits defining whether the unit is being controlled locally or remotely (see IMPORTANT note).
Tx	0	(Transmit) Permits defining, on a parameter-by-parameter basis, the Tx configuration of the unit. These submenu branches would be used if the user wished to change, e.g., just the Tx Frequency.
Rx	5.3.1.3	(Receive) Permits defining, on a parameter-by-parameter basis, the Rx configuration of the unit. These submenu branches would be used if the user wished to change, e.g., just the Rx Frequency.
		(Interface) Permits configuring Interfaces plugged into Slot 1 or Slot 2 at unit's rear panel. The menus change depending on the type of interface – as of this manual revision, ASI, HSSI, or Gigabit Ethernet (GigE) are available:
Int1	5.3.1.4	Intfc1 CDI-40 ASI Interface only.
	5.3.1.5	Intfc1 CDI-60 HSSI Interface only.
Int2	5.3.1.6	Intfc2 CDI-70 Gigabit Ethernet Interface only.
Ref	5.3.1.7	(Reference) Permits selection of the internal 10MHz Reference or allows the unit to phase lock to an External Reference of 1, 2, 5, 10, or 20 MHz.
Aux	5.3.1.8	(Auxiliary) Permits configuring the 1:1 Modem Switching parameters of the unit.
Alarms	5.3.1.9	Provides Alarm action of certain parameters.

IMPORTANT

The modem may be monitored over the remote control bus at any time. When in Local mode, however, configuration parameters may only be changed through the front panel. Conversely, when in Remote mode, the unit may be monitored from the front panel, but configuration parameters may only be changed via the remote control bus.

5.3.1.1 (CONFIG:) Remote (Remote Control)

```
Remote Control: Local  Serial
Ethernet Ser+Eth
```

Select **Local**, **Serial, Ethernet**, or **Ser+Eth** using the ◄ ► arrow keys, then press **ENTER**. Note the following:

SELECTION	ACTION
Local	Remote control is disabled. Remote monitoring is still possible.
Serial	Additional submenus are displayed – RS232, RS485-2W, and RS485-4W.
Ethernet	Additional submenus are displayed – Gateway, Address, MAC, and SNMP.
Ser+Eth	Enables both the Serial and Ethernet remote ports. Note: There are no submenus for this selection. All subsequent configuration of these ports is accomplished using the (CONFIG:) Remote: Serial or (CONFIG:) Remote: Ethernet menus.

(CONFIG: Remote) Local

IMPORTANT

When* Local *is selected, remote control is disabled and local control enabled. Once ENTER is pressed, the user is returned to the CONFIG: menu.

When* Remote *is selected, menu operations associated with Local control are disabled, and the user may see the following messages and prompts when menu or command access associated with Local control is attempted:

```
     THIS UNIT IS CURRENTLY
        IN REMOTE MODE!!
```

(CONFIG: Remote) Serial

```
Serial CONFIG:
Interface  Baudrate   (◄ ►E)
```

Select **Interface** or **Baudrate** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Remote) Serial → Interface

```
M&C Bus Interface: RS232
RS485-2W  RS485-4W   (◄ ►E)
```

Select **RS232** or **RS485-2W** (2-wire) or **RS485-4W** (4-wire) using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Remote) Serial → Interface → RS232

```
In RS232 Mode the Bus
Address is fixed at 0000
```

As per the displayed message, the Bus Address is **fixed** and *not* editable in RS232 mode. Press **ENTER** or **CLEAR** to return to the previous menu.

(CONFIG: Remote) Serial → Interface → RS485-2W, -4W

```
RS485 Mod Address: 0001
                (◄ ► ▲ ▼ E)
```

To edit the RS485 address of the modem, use the ◄ ► arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of that digit. The valid range of addresses is from **0001** to **9999**. Press **ENTER** when done.

(CONFIG: Remote) Serial → Interface → Baudrate

```
Local M&C Bus Baud Rate:
9600 Baud         (▲ ▼  E )
```

To select the baud rate of the remote control bus connected locally to the M&C computer, use the ▲▼ arrow keys to select the desired rate, then press **ENTER**. Baud rates of **1200**, **2400**, **4800**, **9600**, **19200**, **38400**, and **57600** baud are selectable.

Note: The Asynchronous character format is FIXED at 8 data bits, No parity, and 1 stop bit (8-N-1).

(CONFIG: Remote) Ethernet

```
Ethernet CONFIG: Gateway
Address  MAC SNMP   (◄ ►  E)
```

Select **Gateway**, **Address**, **MAC**, or **SNMP** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Remote) Ethernet → Gateway

```
Ethernet IP Gateway:
063.168.001.127  (◄ ► ▲ ▼  E )
```

To edit the IP Gateway address, use the ◄ ► arrow keys to first select the digit to be edited, then use the ▲▼ arrow keys to change the value of that digit. Press **ENTER** when done.

(CONFIG: Remote) Ethernet → Address

```
Ether IP Address/Range:
192.168.001.001/24  (◄ ► ▲ ▼)
```

To edit the IP Address/Range, use the ◄ ► arrow keys to first select the digit to be edited, then use the ▲▼ arrow keys to change the value of that digit. The range is adjustable from **08** to **30**. Press **ENTER** when done.

(CONFIG: Remote) Ethernet → MAC

```
M&C Port MAC Address:
00-06-B0-00-56-33
```

This screen is '*status only*' – Press **ENTER** or **CLEAR** to return to the previous menu.

Note: The preceding address is representative of a typical MAC address.

(CONFIG: Remote) Ethernet → SNMP

```
SNMP:
Community Traps          (LRE)
```

Submenus enable viewing of the Community read string, or setting of the destination IP address for SNMP traps. Select **Community** or **Traps** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Remote) Ethernet → SNMP → Community

```
SNMP Community:
Read                 (▲ ▼ E )
```

Select **Read** using the▲▼ arrow keys, then press **ENTER**.

(CONFIG: Remote) Ethernet → SNMP → Community → Read

```
Read Community:   (◄ ► ▲ ▼ E )
public
```

To edit the SNMP Read Community string, use the ◄ ► arrow keys to select the character to edit, then use the ▲ ▼ arrow keys to edit that character.

Note: Only the first 20 characters on the bottom line are available.

All printable ASCII characters are available with the exception of the backslash (/ ASCII code 92) and tilde (~ ASCII code 126).

Once the string has been composed, press **ENTER**. All trailing spaces are removed from the Read Community string upon entry.

(CONFIG: Remote) Ethernet → SNMP → Community → Traps

```
SNMP Trap IP Address:
IP1  IP2  Version
```

Select **IP1**, **IP2**, or **Version** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Remote) Ethernet → SNMP → Community → Traps → IP1, IP2

```
Trap ID #X:
000.000.000.000  ( ◄ ► ▲ ▼ E )
```

To edit the SNMP Trap IP#1 or IP#2 Address, first use the ◄ ► arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of that digit. Press **ENTER** when done.

(CONFIG: Remote) Ethernet → SNMP → Community → Traps → Version

```
Trap Version:
SNMPv1 SNMPv2       ( ◄ ►E )
```

Select **SNMPv1** or **SNMPv2** using the ◄ ► arrow keys, then press **ENTER**.

5.3.1.2 (CONFIG:) Tx

IMPORTANT

The Scram(bler) selection only appears if the Mode selection is DVB-S2.

```
Tx: FEC  Mod Code SymRate
Mode Freq Pwr Scram ( ◄ ►E)
```

Select **FEC**, **Mod**, **Code**, **SymRate**, **Mode**, **Freq**, **Pwr**, or **Scram** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Tx) FEC

```
Tx FEC:
Viterbi + Reed-Solomon ( ◄ ►E)
```

This screen is '*status only*' and its appearance depends on the selection made under the **(CONFIG:) Tx → Mode** menu.

For DVB-S2 Mode only:

```
Tx FEC:
LDPC + BCH              (◀ ▶E)
```

Press **ENTER** or **CLEAR** to return to the previous menu

(CONFIG: Tx) Mod

The Pilot and Frame selections only appear if the Mode selection is DVB-S2.

```
Tx Modulation: Type Inv
α Pilot Frame         (◀ ▶E)
```

Select **Type**, **Inv**, **α**, **Pilot**, or **Frame** using the ◀ ▶ arrow keys, then press **ENTER**.

(CONFIG: Tx:) Mod → Type

```
Tx Mod: QPSK  8PSK  16QAM
16APSK  32APSK       (◀ ▶E)
```

Use the ◀ ▶ arrow keys to select the Transmit Modulation Type, then press **ENTER.** Note the following:

Tx Mode Selection	Valid for…
QPSK	DVB-S, DVB-S2
8-PSK	DVB-S2, DVB-DSNG
16-QAM	DVB-DSNG
16-APSK	DVB-S2
32-APSK	DVB-S2

(CONFIG:Tx) Mod → Inv

```
Tx Spectrum:          Normal
Inverted               (◀ ▶E)
```

Select **Normal** or **Inverted** using the ◀ ▶ arrow keys, then press **ENTER**.

(CONFIG: Tx) Mod → α

```
Tx (α) Rolloff %:  20  25
35                    (◄ ►E)
```

The default **Rolloff (α)** setting is **20%**. Whenever the Mode is changed, **(α)** reverts to **20%**, but **(α)** can be modified to **25%** or **35%** from this menu. Select the value using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Tx) Mod → Pilot *(DVB-S2 mode only)*

```
Tx Modulation Pilot:
Off/On   Avg/Peak    (◄ ►E)
```

Select **Off/On** or **Avg/Peak** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Tx) Mod → Pilot → Off/On *(DVB-S2 mode only)*

```
Tx Modulation Pilot:
Off/On   Avg/Peak    (◄ ►E)
```

The default value is **Off.** Select **Off** to disable insertion of pilot symbols into the physical layer frame. Select **On** to enable insertion of pilot symbols into the physical layer frame. Use the ◄ ► arrow keys to make the selection, then press **ENTER**.

(CONFIG: Tx) Mod → Pilot → Avg/Peak *(DVB-S2 mode only)*

```
Tx Modulation Pilot:
Average  Peak        (◄ ►E)
```

The solid cursor indicates the current configuration choice. The CDM-710 automatically adjusts, but the default value is **Average**. Select **Average** or **Peak** using the ◄ ► arrow keys, then press **ENTER**. Note the following:

- Select **Average** to set the pilots and header to the average power band of the transmitted constellation (QPSK, 8PSK, 16APSK or 32APSK) per DVB-S2.
- Select **Peak** to set the pilots and header to the outer ring of the transmitted constellation (QPSK, 8PSK, 16APSK or 32ASK).

IMPORTANT

Not all commercially available demodulators will function well with the Peak pilot level.

(CONFIG: Tx) Mod → Frame *(DVB-S2 mode only)*

```
Tx Frame Size:
Long  Short          (◄ ►E)
```

Select **Long** or **Short** using the ◄ ► arrow keys, then press **ENTER**. The default value is **Long**. When **Long** is selected, the standard FECFRAME = 64,800 bits is enabled. If **Short** is selected, the FECFRAME = 16,200 bits is enabled.

Note: Only DVB-S2 allows a FECRAME choice.

(CONFIG: Tx) Code

```
Tx CodeRate: 1/2 3/5 2/3
3/4 4/5 5/6 7/8 8/9 9/10
```

Refer to the Data Rate menu for valid code rates.

- ***All possible choices are presented at all times.***
- ***If an option is not installed (either Hardware or FAST) or is not valid, or if a code rate is not available for the Mode selected, the ◄ ► arrow keys will force the cursor to skip past the unavailable choice.***

Use the ◄ ► arrow keys to select the code rate, then press **ENTER**.

(CONFIG : Tx) SymRate

```
Data: 038.723635 Mbps
Sym: 017.379483 Msps(E)
```

Use the ◄ ► arrow keys to select the desired digit of the Symbol Rate, then use the ▲▼ arrow keys to change the value of that digit. Press **ENTER** when done.

The Data Rate digits also change as the Symbol Rate values are edited. The value of the Data Rate depends upon the code rate, modulation type, and the Mode type selected.

When modulation, code rate and other parameters are changed the modem attempts to maintain the same Symbol Rate, provided it is still in range when one of the other parameters is changed.

The valid range of Symbol Rate and Data Rate Range for DVB-S2, DVB-S and DVB-DSNG are shown in the following table. When programming a new data or symbol rate the modulator will not accept it unless it is in the range, and it will turn off the Tx Carrier. If a new rate is not accepted, change the Modulator Code Rate or Mode. There is some round off in the data rate ranges in the last digit. The first table is for the standard FECFrame and the second table is for the short frame.

The tables are based on a 188 byte frame format. When a 204 byte format is selected the data rate increases by 204/188.

Table 5-1. Symbol Rate / Data Rate Range – Standard FECFrame and 188 Byte Format

(QPSK 1/4, 1/3 and 2/3 data is for informational purposes only)

Modulation	FEC Code	Inner Code Rate	Symbol Rate (Msps)		Spectral Efficiency	Data Rate (Mbps) Pilot OFF		Spectral Efficiency	Data Rate (Mbps) Pilot ON	
			Min	Max	Pilot OFF	Min	Max	Pilot ON	Min	Max
DVB-S2 - Standard FEC Frame = 64,800 Bits										
QPSK	LDPC+BCH	1/4	1	45	0.490243	0.490243	22.060942	0.478577	0.478577	21.535965
		1/3			0.656448	0.656448	29.540166	0.640827	0.640827	28.837209
		2/5			0.789412	0.789412	35.523546	0.770627	0.770627	34.678204
		1/2			0.988858	0.988858	44.498615	0.965327	0.965327	43.439697
		3/5			1.188304	1.188304	53.473684	1.160026	1.160026	52.201190
		2/3			1.322253	1.322253	59.501385	1.290788	1.290788	58.085452
		3/4			1.487473	1.487473	66.936288	1.452076	1.452076	65.343429
		4/5			1.587196	1.587196	71.423823	1.549426	1.549426	69.724175
		5/6			1.654663	1.654663	74.459834	1.615288	1.615288	72.687939
		8/9			1.766451	1.766451	79.490305	1.724416	1.724416	77.598702
		9/10			1.788612	1.788612	80.487535	1.746049	1.746049	78.572201
8PSK	LDPC+BCH	3/5	1	45	1.779991	1.779991	80.099585	1.739569	1.739569	78.280616
		2/3			1.980636	1.980636	89.128631	1.935658	1.935658	87.104623
		3/4			2.228124	2.228124	100.265560	2.177525	2.177525	97.988646
		5/6			2.478562	2.478562	111.535270	2.422276	2.422276	109.002433
		8/9			2.646012	2.646012	119.070539	2.585924	2.585924	116.366586
		9/10			2.679207	2.679207	120.564315	2.618365	2.618365	117.826440
16APSK	LDPC+BCH	2/3	1	35	2.637201	2.637201	92.302026	2.574613	2.574613	90.111471
		3/4			2.966728	2.966728	103.835482	2.896320	2.896320	101.371209
		4/5			3.165623	3.165623	110.796808	3.090495	3.090495	108.167326
		5/6			3.300184	3.300184	115.506446	3.221863	3.221863	112.765192
		8/9			3.523143	3.523143	123.310006	3.439530	3.439530	120.383555
		9/10			3.567342	3.567342	124.856967	3.482680	3.482680	121.893803
32APSK	LDPC+BCH	3/4	1	28	3.703295	3.703295	103.692261	3.623332	3.623332	101.453291
		4/5			3.951571	3.951571	110.643985	3.866247	3.866247	108.254911
		5/6			4.119540	4.119540	115.347126	4.030589	4.030589	112.856500
		8/9			4.397854	4.397854	123.139923	4.302894	4.302894	120.481032
		9/10			4.453027	4.453027	124.684751	4.356875	4.356875	121.992503
DVB-S & DVB-DSNG FEC Frame Does Not Apply										
QPSK	Conv+RS	1/2	1	45	0.921569	0.921569	41.470588	-	-	-
		2/3			1.228758	1.228758	55.294118	-	-	-
		3/4			1.382353	1.382353	62.205882	-	-	-
		5/6			1.535948	1.535948	69.117647	-	-	-
		7/8			1.612745	1.612745	72.573529	-	-	-
8-PSK	Conv+RS	2/3	1	45	1.843137	1.843137	82.941176	-	-	-
		5/6			2.303922	2.303922	103.676471	-	-	-
		8/9			2.457516	2.457516	110.588235	-	-	-
16-QAM	Conv+RS	3/4	1	45	2.764706	2.764706	124.411765	-	-	-
		7/8			3.225490	3.225490	145.147059	-	-	-

Table 5-2. Symbol Rate / Data Rate Range – Short FECFrame and 188 Byte Format

Modulation	FEC Code	Inner Code Rate	Symbol Rate (Msps)		Spectral Efficiency Pilot OFF	Data Rate (Mbps) Pilot OFF		Spectral Efficiency Pilot ON	Data Rate (Mbps) Pilot ON	
			Min	Max		Min	Max		Min	Max
DVB-S2 - Short FEC Frame = 16,200 Bits										
QPSK	LDPC+BCH	1/4	1	45	0.365324	0.365324	16.439560	0.357467	0.357467	16.086022
		1/3			0.629060	0.629060	28.307692	0.615532	0.615532	27.698925
		2/5			0.760928	0.760928	34.241758	0.744564	0.744564	33.505376
		1/2			0.848840	0.848840	38.197802	0.830585	0.830585	37.376344
		3/5			1.156532	1.156532	52.043956	1.131661	1.131661	50.924731
		2/3			1.288400	1.288400	57.978022	1.260693	1.260693	56.731183
		3/4			1.420269	1.420269	63.912088	1.389725	1.389725	62.537634
		4/5			1.508181	1.508181	67.868132	1.475747	1.475747	66.408602
		5/6			1.596093	1.596093	71.824176	1.561768	1.561768	70.279570
		8/9			1.727961	1.727961	77.758242	1.690800	1.690800	76.086022
		9/10			N/A	N/A	N/A	N/A	N/A	N/A
8PSK	LDPC+BCH	3/5	1	45	1.725319	1.725319	77.639344	1.692033	1.692033	76.141479
		2/3			1.922040	1.922040	86.491803	1.884959	1.884959	84.823151
		3/4			2.118761	2.118761	95.344262	2.077885	2.077885	93.504823
		5/6			2.381056	2.381056	107.147541	2.335120	2.335120	105.080386
		8/9			2.577778	2.577778	116.000000	2.528046	2.528046	113.762058
		9/10			N/A	N/A	N/A	N/A	N/A	N/A
16APSK	LDPC+BCH	2/3	1	35	2.548792	2.548792	89.207729	2.505223	2.505223	87.682811
		3/4			2.809662	2.809662	98.338164	2.761633	2.761633	96.657170
		4/5			2.983575	2.983575	104.425121	2.932574	2.932574	102.640076
		5/6			3.157488	3.157488	110.512077	3.103514	3.103514	108.622982
		8/9			3.418357	3.418357	119.642512	3.359924	3.359924	117.597341
		9/10			N/A	N/A	N/A	N/A	N/A	N/A
32APSK	LDPC+BCH	3/4	1	28	3.493093	3.493093	97.806607	3.419165	3.419165	95.736626
		4/5			3.709309	3.709309	103.860661	3.630805	3.630805	101.662551
		5/6			3.925526	3.925526	109.914715	3.842446	3.842446	107.588477
		8/9			4.249850	4.249850	118.995796	4.159906	4.159906	116.477366
		9/10			N/A	N/A	N/A	N/A	N/A	N/A

(CONFIG: Tx) Mode

```
Transmission Mode:
S2-G/S2-TS S DSNG
```

The TX Mode is a key parameter for setting all modem parameters, and it is generally easier if it is set first. The Mode determines which modulation, code rates, FEC type and symbol rate range are available and also if Pilots or Gold Code settings are available. Changing the Mode will change one or more of these.

Select **S2-G/S2-TS**, **S**, or **DSNG** using the ◄ ► arrow keys, then press **ENTER**. After changing modes, check the modulation, code, and data rate selections.

(CONFIG: Tx) Mode → S2-G/S2-TS *(DVB-S2 mode only)*

If **S2-G/S2-TS** is selected, the **(CONFIG:) Tx → Mode → S2-G/S2-TS** option becomes available:

```
Transport Mode: Generic
TransportStream      (◄ ►E)
```

This command applies only for a CDI-60 HSSI interface in DVB-S2 mode. .

The default Transport Mode is **TransportStream**, regardless of mode or interface type. Select **Generic** or **TransportStream** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Tx) Frequency

```
TX Freq: 0140.0000 MHz
              (◄ ► ▲ ▼E)
```

To edit the Tx IF Frequency, use the ◄ ► arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of that digit. Press **ENTER** when done.

Note the following:

CDM-710 (70/140 MHz)	The ranges of frequencies are from 52 to 88 MHz and from 104 to 176 MHz with a resolution of 100 Hz.
CDM-710L (L-Band)	The range is 950 to 2000 MHz with 100 Hz resolution.

The bandwidth of the modulated Tx carrier must stay within the IF frequency range. The modem disallows settings that exceed the range, and will turn off the Tx Carrier.

(CONFIG: Tx) Pwr

```
TX Power: Level
On/Off Imped      (◄ ►E)
```

Select **Level, On/Off,** or **Imped** using the ◄ ► arrow keys, then press **ENTER**.

The Imped(ance) selection is only available/displayed when the 70/140 MHz Modulator card is installed.

(CONFIG: Tx) Pwr → Level

```
TX Output Power Level:
-10.0 dBm       (◄ ► ▲ ▼ E)
```

To edit the TX Power level, use the ◄ ► arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of that digit. Press **ENTER** when done. Note the following:

CDM-710 (70/140 MHz)	The range is from 0 to -20 dBm.
CDM-710L (L-Band)	The range is from -5 to -25 dBm.

(CONFIG: Tx) Pwr → On/Off

```
Tx Output State:
Off On              (◄ ► E)
```

Select **On** or **Off** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Tx) Pwr → Imped

```
TX Impedance (Ohms):
50 75               (◄ ► E)
```

This submenu is selectable/displayed only when the 70/140 MHz Modulator card is installed. Note the following:

CDM-710 (70/140 MHz)	Select **50** or **75**(Ω) using the ◄ ► arrow keys, then press **ENTER.**
CDM-710L (L-Band)	**Not applicable.**

(CONFIG: Tx) Scram *(DVB-S2 mode only)*

IMPORTANT

The Scram(bler) menu is available only when the Mode selection is DVB-S2.

```
Tx Scrambling Index:
Gold-n = 000000   (◄ ►▲ ▼ E)
```

The Gold-n Index indicates the Physical Layer spreading sequence number.

To edit the index, use the ◄ ► arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of that digit. The index can be set from **000000** to **262,141 –** the default setting is all **0**s. Press **ENTER** when done.

5.3.1.3 (CONFIG:) Rx

```
Rx: FEC Dem Code SymRate
Mode Freq EbNo PLL     (◄ ►E)
```

Select **FEC**, **Dem**(od), **Code**, **SymRate**, **Mode**, **Freq**, **EbNo**, or **PLL** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Rx) FEC

```
Rx FEC:
Viterbi + Reed-Solomon (◄ ►E)
```

This screen is '*status only*' and its appearance depends on the selection made under the **(CONFIG: Rx) Mode** submenu.

For DVB-S2 Mode only:

```
Rx FEC:
LDPC + BCH           (◄ ►E)
```

Press **ENTER** or **CLEAR** to return to the previous menu

(CONFIG: Rx) Dem (Demod)

```
Rx Demod: Type Inv Acq α
Eq IQ-TP Pilot Scr (◄ ►E)
```

The Pilot and Scr(ambler) selections appear only when the Mode selection is DVB-S2.

Select **Type**, **Inv**, **Acq**, **α**, Eq, **IQ-TP**, **Pilot**, or **Descr** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Rx) Dem → Type

```
Rx Dem:  QPSK 8PSK 16QAM
16APSK  32APSK    (◄ ►E)
```

Select the demodulation type using the ◄ ► arrow keys, then press **ENTER**. Note the following:

- If the Mode selected is **DVB-DSNG**, the allowable modes are selectable depending upon the equipment options purchased.
- If the Mode selected is **DVB-S,** this screen is '*status only*' and the cursor rests under **QPSK**.
- If the Mode selected is **DVB-S2,** this screen is '*status only*' and the type of modulation is determined automatically. Prior to synchronization of the Rx path, the cursor may reside in any position. After synchronization (**Rx TRAFFIC** LED is **Green**), re-enter the Type menu to update the display; the cursor then rests under the modulation type.

(CONFIG: Rx) Dem → Inv

```
Rx Spectrum:
Automatically Detected.
```

This screen is '*status only*' as the demodulator automatically resolves frequency inversion. **Normal** or **Inverted** is *not* reported in the demodulation. Press **ENTER** or **CLEAR** to return to the previous menu.

(CONFIG: Rx) Dem → Acq

```
Demod Acquisition Range:
+/-010 kHz       (◄ ►▲ ▼ E)
```

The value entered here determines the amount of frequency uncertainty the demodulator will search over in order to find and lock to an incoming carrier.

To edit the demodulator acquisition search range value, use the ◄ ► arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of that digit. The range varies from ±**001** kHz to ±**100** kHz. Press **ENTER** when done.

(CONFIG: Rx) Dem → α

```
RX (α) Rolloff %: 20  25
35                  (◄ ►E)
```

The Rolloff (α) dictates how fast the spectral edges of the carrier are attenuated beyond the 3 dB bandwidth. With 20% rolloff the edge falls off more quickly than with 25% and 35%.

Select the value using the ◄ ► arrow keys, then press **ENTER**. The default **Rolloff (α)** setting is **20%**; whenever the mode is changed, **(α)** reverts to **20%** but can be modified to **25%** or **35%** using this menu.

(CONFIG: Rx) Dem → Eq

```
Rx Adaptive Equalizer:
 Off On              (◄ ►E)
```

The adaptive equalizer helps correct for linear distortion in the rest of the link. Linear distortion includes amplitude and phase that would occur due to imperfect filtering effects, but it does not include distortion due to non linear amplifiers.

Select operation as **Off** or **On** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Rx) Dem → IQ-TP

```
Rx IQ TPs (J2-11,J2-3):
Pre-EQ   Post-EQ    (◀ ▶E)
```

This selection determines whether the IQ test point located on the Alarm Connector samples the IQ signal *before* or *after* the Adaptive Equalizer. **J2-11** and **J2-3** refer to the Alarms Connector pins to which an oscilloscope is connected, for the purpose of monitoring I and Q.

Select **Pre-Eq** or **Post-Eq** using the ◀ ▶ arrow keys, then press **ENTER**.

(CONFIG: Rx) Dem → Pilot *(DVB-S2 mode only)*

```
Rx Demodulation Pilot:
Off On               (◀ ▶E)
```

This screen is '*status only*' as the demodulator automatically determines if the pilots are ***Off*** or ***On***.

Press **ENTER** or **CLEAR** to return to the previous menu.

(CONFIG: Rx) Dem → Scr (Descrambler)*(DVB-S2 mode only)*

```
Rx Descrambling Index:
Gold-n = 000000  (◀ ▶▲ ▼ E)
```

The Gold-n Index indicates the Physical Layer spreading sequence number.

To edit the index, use the ◀ ▶ arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of that digit. The index can be set from **000000** to **262,141 –** the default setting is all **0**s. Press **ENTER** when done.

(CONFIG: Rx) Code

```
Code Rate: 1/2 3/5 2/3
3/4 4/5 5/6 7/8 8/9 9/10
```

Refer to the Data Rate menu for valid code rates. The cursor only lands on valid code rates depending upon the mode and purchased options. If the Mode is set to DVB-S2, this screen is '*status only*' and the demodulator automatically resolves the code rate.

Prior to synchronization of the Rx path, the cursor may reside in any position.

- ***All possible choices are presented at all times.***
- ***If an option is not installed (either Hardware or FAST) or is not valid, or if a code rate is not available for the Mode selected, the ◀ ▶ arrow keys will force the cursor to skip past the unavailable choice.***

Select the code rate by using the ◀ ▶ arrow keys, then press **ENTER**.

(CONFIG: Rx) SymRate

```
Data: 017.185842 Mbps
 Sym: 017.379483 Msps   (E)
```

If the Rx Path is not locked, the message should as shown in the above example. To change the Symbol Rate, use the ◄ ► arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of that digit. Press **ENTER** when done.

In **DVB-S** and **DVB-DSNG** Mode, the Data Rate digits also change as the Symbol Rate values are edited. The value of the Data Rate depends upon the code rate, modulation type. When programming a new symbol rate (or indirectly a data rate) the value is not accepted unless it is within a valid range.

See the tables under the **(CONFIG:) Tx → SymRate** menu for the valid range of symbol / data rates.

In **DVB-S2** Mode, **`Demod Unlocked`** in place of the 'Data:' value (on the top line) while the Rx path is not synchronized. After synchronization, the correct data rate appears in the display and the demodulator has automatically resolved the modulation type, code rate, pilots ON/OFF, FEC frame length, spectral inversion, etc. from the DVB-S2 carrier.

(CONFIG: Rx) Mode

```
Receive Mode (DVB):
S2-G/S2-TS S DNG
```

The RX Mode is a key parameter for setting all modem parameters, and it is generally easier if it is set first. The Mode determines which demodulation, code rates, FEC type and symbol rate range are available and also if Pilots or Gold Code settings are available. Changing the Mode will change one or more of these. The available range also determines on the FAST options selected at time of purchase.

Select **S2-G/S2-TS**, **S**, or **DSNG** using the ◄ ► arrow keys, then press **ENTER**. After changing modes, check the modulation, code, and data rate selections.

(CONFIG: Rx) Freq

```
RX Freq: 0140.0000 MHz
                 (◄ ►▲ ▼ E)
```

Edit the RX IF Frequency. Use the ◄ ► arrow keys to select the digit to be edited. Use the ▲▼ arrow keys to change the value of that digit, then press **ENTER**. Note the following:

CDM-710 (70/140 MHz)	The ranges of frequencies are from 52 to 88 MHz and from 104 to 176 MHz with a resolution of 100 Hz.
CDM-710L (L-Band)	The range is 950 to 2000 MHz with 100 Hz resolution.

IMPORTANT

The bandwidth of the modulated carrier MUST stay within the IF frequency range, or the frequency is not accepted.

(CONFIG: Rx) Eb/No

```
Eb/No Alarm: Threshold
Alarm/Fault        (◄ ►E)
```

Select **Threshold, Alarm/Fault**, or **Masked** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Rx) Eb/No → Threshold

```
Eb/No Alarm Threshold:
2.0 dB  Masked    (◄ ►▲ ▼ E)
```

The range of Eb/No alarm point values is from **0.1** to **16.0** dB. If the Eb/No falls below the selected value, a receive traffic fault is generated.

To edit the threshold, use the ◄ ► arrow keys to select the digit to be edited, then use the ▲ ▼ arrow keys to change the value of that digit. Press **ENTER** when done.

(CONFIG: Rx) Eb/No → Alarm/Fault

```
Eb/No Alarm:
Alarm  Fault  Mask      (◄ ►E)
```

The available choices define the Eb/No Alarm as an **Alarm**, as a **Fault**, or to completely **Mask** the alarm. This choice affects operation in 1:1 redundancy.

Select **Alarm, Fault**, or **Masked** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Rx) PLL

```
Carrier PLL Bandwidth:
1x 2x             (◄ ►E)
```

This selection is sometimes useful when high phase noise is present. Select **1x** or **2x** using the ◄ ► arrow keys, then press **ENTER**. **1x** is the normal operating mode.

5.3.1.4 (CONFIG:) Int1 (CDI-40 ASI Interface Only)

Due to limitations of the backplane, the CDM-710 allows only one interface to be active. For example, if Interface 2 is active, and Interface 1 is then enabled/ selected, the unit will automatically* disable *Interface 2.

Note: The menu branch and submenus depicted in this section are dependent on the presence of the CDI-40 ASI Interface card, installable in Interface Slot 1 *only*.

```
Intfc1 ASI:
Tx    Rx    Config   (◄ ►E)
```

Select **Tx**, **Rx**, or **Config** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 ASI) Tx

```
Intfc1 ASI Tx:
Ena/Dis   Frame     (◄ ►  E)
```

Select **Ena/Dis** or **Frame** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 ASI) Tx → Ena/Dis

```
Intfc1 ASI Tx:
Enable Disable   (◄ ►  E)
```

Using the ◄ ► arrow keys, select **Enable** to *activate* the Tx side of this interface, or select **Disable** to *de-activate* the Tx side and set the Data Rate to 0. Press **ENTER** when done.

(CONFIG: Intfc1 ASI) Tx → Frame

```
Intfc1 ASI Tx Frame:
188   204    (◄ ►  E)
```

To enable the desired sync mode, select **108** or **204** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 ASI) Rx

```
Intfc1 ASI Rx:
Ena/Dis   Frame     (◄ ►  E)
```

Select **Ena/Dis** or **Frame** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 ASI) Rx → Ena/Dis

```
Intfc1 ASI Rx:
Enable Disable   (◄ ►  E)
```

Using the ◄ ► arrow keys, select **Enable** to *activate* the Rx side of this interface, or select **Disable** to *de-activate* the Rx side and set the Data Rate to 0. Press **ENTER** when done.

(CONFIG: Intfc1 ASI) Rx →Frame

```
Intfc1 ASI Rx Frame:
188   204         (◄ ► E)
```

To enable the desired sync mode, select **108** or **204** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 ASI) Config

```
Intfc1 ASI CONFIG:
Port      Bandwidth  (◄ ► E)
```

Select **Port** or **Bandwidth** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 ASI) Config → Port

```
Intfc1 ASI Port:
J4   J5            (◄ ► E)
```

To select the active port on the ASI Interface, select **J4** or **J5** using the ◄ ► arrow keys, then press **ENTER**.

Note: Also see **(CONFIG:) AUX → 1:1 Mode** for redundancy operation.

(CONFIG: Intfc1 ASI) Config → Bandwidth

```
Intfc1 ASI Bandwidth:
Wide    Narrow      (◄ ► E)
```

To select the loop bandwidth of the ASI input, select **Wide** or **Narrow** using the ◄ ► arrow keys, then press **ENTER**.

Terrestrial jitter sometimes increases when data is sent across the **P**ublic **S**witched **T**elecom **N**etwork (PSTN).

Wide corresponds to about 2 Hz and **Narrow** is approximately 0.5 Hz. Normally, the **Wide** selection is adequate, but when higher amounts of terrestrial jitter are present in the incoming ASI data stream the **Narrow** setting will help reduce jitter.

5.3.1.5 (CONFIG:) Int1 (CDI-60 HSSI Interface Only)

Due to limitations of the backplane, the CDM-710 allows only one interface to be active. For example, if Interface 2 is active, and Interface 1 is then enabled/ selected, the unit will automatically* disable *Interface 2.

Note: The menu branch and submenus depicted in this section are dependent on the presence of the CDI-60 HSSI Interface card, installable in Interface Slot 1 *only*.

```
Intfc1  HSSI:
Tx Rx CTS/RTS          (◄ ►E)
```

There is a single port on a CDI-60 HSSI Interface. Select **Tx, Rx**, or **CTS/RTS** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 HSSI) Tx

```
Intfc1  Tx
Data  Clock  Enable    (◄ ►E)
```

Select **Data, Clock**, or **Enable** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 HSSI) Tx → Data

```
Intfc1  Tx Data:
Datarate  Invert       (◄ ►E)
```

Select **Datarate** or **Invert** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 HSSI) Tx → Data → Datarate

```
Intfc1  Data Rate:
Tx: 032.000000 Mbps
```

This screen is '*status only*' and indicates the Data Rate of the transmit MPEG-2 transport stream. Press **ENTER** or **CLEAR** to return to the previous menu.

(CONFIG: Intfc1 HSSI) Tx → Data → Invert

```
Intfc1  Tx Data Invert:
Normal Inverted        (◄ ►E)
```

To control data inversion (added for compatibility with certain older equipment), select **Normal** or **Inverted** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 HSSI) Tx → Clock

```
Intfc1  Tx Clock:
Normal  Inverted      (◄ ►E)
```

To control clock inversion (added for compatibility with certain older equipment), select **Normal** or **Inverted** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 HSSI) Tx → Enable

```
Intfc1  Tx Enable:
Enable  Disable       (◄ ►E)
```

Using the ◄ ► arrow keys, select **Enable** to *activate* the Tx side of this interface, or select **Disable** to *de-activate* the Tx side and set the Data Rate to 0. Press **ENTER** when done.

(CONFIG: Intfc1 HSSI) Rx

```
Intfc1  Rx:
Data Buffer Clock Enable
```

Select **Data, Buffer, Clock**, or **Enable** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 HSSI) Rx → Data

```
Intfc1  Rx Data:
Datarate  Invert     (◄ ►E)
```

Select **Datarate** or **Invert** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 HSSI) Rx → Data → Datarate

```
Intfc1  Data Rate:
Rx: 032.000000 Mbps
```

This screen is '*status-only*' and indicates the Data Rate of the received MPEG-2 transport stream. Press **ENTER** or **CLEAR** to return to the previous menu.

(CONFIG: Intfc1 HSSI) Rx → Data → Invert

```
Intfc1  Rx Data Invert:
Normal Inverted      (◄ ►E)
```

To control data inversion (added for compatibility with certain older equipment), select **Normal** or **Inverted** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 HSSI) Rx → Buffer

```
Intfc1  Rx Buffer:
Size  Recenter        (◄ ►E)
```

Select **Size** or **Recenter** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 HSSI) Rx → Buffer → Size

```
Intfc1 Rx Buffer Size:
10.0 mSec (0343,680 Bits)
```

The range of Rx Buffer Size values is from **5.0** to **32.0** mSec in **0.1** mSec increments. To edit, use the ◄ ► arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of that digit. Press **ENTER** when done.

(CONFIG: Intfc1 HSSI) Rx → Buffer → Recenter

```
Intfc1 Rx Buffer Fill:
(046%) ReCenter      (◄ ►E)
```

This screen indicates the current buffer fill status – in this example, the percentage is listed at 46%. To reset the buffer to the midpoint (50%), select **ReCenter** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 HSSI) Rx → Clock

```
Intfc1 Rx Clock:
Source  Invert      (◄ ►E)
```

Select **Source** or **Invert** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 HSSI) Rx → Clock → Source

```
Intfc1  Rx Clock:
Rx-Sat Tx-Terr Internal
```

This selection determines which source clocks the output of the Rx Buffer for delivering data to the Rx port at the user interface. Select **Rx-Sat, Tx-Terr**, or **Internal** using the ◄ ► arrow keys, then press **ENTER**. Note the following:

Rx-Sat (default)	Effectively disables the Rx Buffer because the input and output clocks are the same. Normally, the Rx Buffer is set for minimum when Rx-Sat is selected.
Tx-Terr	Uses the clock from the Tx input (TT) to clock out the Rx Buffer.
Internal	Derives a clock from the internal 10 MHz reference clock.

(CONFIG: Intfc1 HSSI) Rx → Clock → Invert

```
Intfc1 Rx Clock Invert:
Normal  Inverted      (◄ ►E)
```

This selection controls clock inversion (added for compatibility with certain older equipment). Select **Normal** or **Inverted** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc1 HSSI) Rx → Enable

```
Intfc1 Rx Enable:
Enable Disable        (◄ ►E)
```

Using the ◄ ► arrow keys, select **Enable** to *activate* the Rx side of this interface, or select **Disable** to *de-activate* the Rx side and set the Data Rate to 0. Press **ENTER** when done.

(CONFIG: Intfc1 HSSI) RTS/CTS

```
Intfc1 CTS/RTS:
Normal  Fault
```

Select **Normal** or **Fault** using the ◄ ► arrow keys, then press **ENTER**.

Note: CTS is the same as CA, and RTS is the same as TA. The selections operate as follows:

- Normal: CTS = RTS
- Fault: CTS = RTS when no fault is present. CTS is not asserted when a fault is present.

5.3.1.6 (CONFIG:) Int2 (CDI-70 Gigabit Ethernet Interface Only)

Due to limitations of the backplane, the CDM-710 allows only one interface to be active. For example, if Interface 1 is active, and Interface 2 is then 'enable selected', the unit will automatically disable Interface 2.

Note: The CDM-710 supports a single CDI-70 Gigabit Ethernet Interface (Intfc2), installable in Slot 2 **only**; there is a single RJ-45 port on the CDI-70 Gigabit Ethernet Interface. The menu branch and submenus depicted in this section show what is available when the CDI-70 Gigabit Ethernet Interface card is installed in Interface Slot 2.

```
Intfc2 Gigabit Ethernet:
Ingress Egress Man Stats
```

Select **Ingress**, **Egress**, **Man,** or **Stats** using the ◄ ► arrow keys, then press **ENTER**.

Note, for the purpose of the documentation of this interface, the following:

- Ingress refers to IP packets received from the LAN
- Egress refers to IP packets transmitted to the LAN
- Transmit refers to MPEG packets transmitted to the WAN
- Receive refers to MPEG packets received from the WAN

(CONFIG: Intfc2 Gigabit Ethernet) Ingress

```
Intfc2 Gigabit Ingress:
Ena/Dis FEC Str    (◄ ►E)
```

Select **Ena/Dis, FEC,** or **Str** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Ena/Dis

```
Intfc2 Ingress Enable:
Enable Disable
```

Select **Enable** or **Disable** using the ◄ ► arrow keys, then press **ENTER**. **Enable** is selected for transmission of the ingress (received from LAN) MPEG-2 transmission stream. **Disable** is selected to *turn off* the MPEG-2 transmission to the WAN.

(CONFIG: Intfc2 Gigabit Ethernet) Ingress → FEC

```
Intfc2 Ingress FEC
Enable Disable
```

Select **Enable** or **Disable** using the ◄ ► arrow keys, then press **ENTER**. **Enable** for the GbEI to perform **SMPTE 2022 / Pro-MPEG COP3** error recovery. **Disable** is selected to *bypass* the **SMPTE 2022 / Pro-MPEG COP3** function.

Note: SMPTE absorbed the per-MPEG Forum and released SMTE 2022.

(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str

```
Intfc2 Streams   Act=1
IP Mode Pri Red Timeout
```

The top line indicates the active stream. On the bottom line, select **IP**, **Mode**, **Pri**, **Red,** or **Timeout** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → IP

```
Intfc2 Multicast Streams
1  2  Port
```

Select **1**, **2**, or **Port** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → IP → 1,2

```
Intfc2 Address #
Group Source
```

*Where # is the selected stream (**1** or **2**):* Select **Group** or **Source** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → IP → 1,2 → Group

```
Intfc2 Multicast #
224.001.001.002     ◄ ► ▲ ▼
```

*Where # is the selected stream (**1** or **2**):* To enter the Group Multicast IP address for the selected stream, first use the ◄ ► arrow keys to select the desired digit to edit, then use the ▲ ▼ arrow keys to change the value of that digit. Press **ENTER** when done.

(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → IP → 1,2 → Source

```
Intfc2 Source IP #
224.001.001.002     ◄ ► ▲ ▼
```

*Where # is the selected stream (**1** or **2**):* To enter the Source Multicast IP address for the selected stream, first use the ◄ ► arrow keys to select the desired digit to edit, then use the ▲ ▼ arrow keys to change the value of that digit. Press **ENTER** when done.

(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → IP → Port

```
Intfc2 UDP Port
05060
```

To enter the Destination UDP port for ingress streams, first use the ◄ ► arrow keys to select the desired digit to edit, then use the ▲ ▼ arrow keys to change the value of that digit. Press **ENTER** when done.

(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → Mode

```
Intfc2 Multicast Mode
Single  Dual
```

Select **Single** or **Dual** using the ◄ ► arrow keys, then press **ENTER**.

Select **Single** if one IP connection carrying an MPEG-2 transport stream is present, or if automatic redundancy switching is disabled.

Select **Dual** for redundancy operation with dual IP connections, each transporting an MPEG-2 transport stream, and automatic switching between the two streams is performed.

(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → Pri

```
Intfc2 Primary Stream
1  2
```

Select **1** (Single) or **2** (Redundancy) Mode using the ◄ ► arrow keys, then press **ENTER**.

In **Single** mode, this assigns which (of up to two) streams is processed. In **Redundancy** mode, this identifies which of two streams are initially processed before any redundancy switch takes place.

(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → Red

```
Intfc2 Redundancy
Revertive  Non-Revertive
```

Select **Revertive** or **Non-Revertive** using the ◄ ► arrow keys, then press **ENTER**.

In **Revertive** Redundancy mode, either stream can be processed in the event of the failure of the other stream.

In **Non-revertive** Redundancy mode, a switch from the primary stream to the secondary stream can occur, but a switch from the secondary stream to the primary stream will not occur in the event of a failure of the secondary stream. In this latter case, user intervention is required.

(CONFIG: Intfc2 Gigabit Ethernet) Ingress → Str → Timeout

```
Intfc2 Stream Timeout
0500 mS
```

For use in Dual Stream Mode only: Assign the period (in 100 mS increments) for a primary connection failure to be present before switchover to the secondary connection occurs by using the ▲ ▼ arrow keys. Press **ENTER** when done.

(CONFIG: Intfc2 Gigabit Ethernet) Egress

```
Intfc2 Gigabit Egress:
Ena/Dis FEC IP  (◀ ▶E)
```

Select **Ena/Dis, FEC,** or **IP** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc2 Gigabit Ethernet) Egress → Ena/Dis

```
Intfc2 Egress Enable:
Enable Disable
```

Select **Enable** or **Disable** using the ◄ ► arrow keys, then press **ENTER**. **Enable** is selected to *allow* reception of the IP-encapsulated MPEG packets to the LAN (egress). **Disable** is selected to *turn off* the egress packets to the LAN.

(CONFIG: Intfc2 Gigabit Ethernet) Egress → FEC

```
Intfc2 FEC
Ena/Dis Matrix  (◀ ▶E)
```

This menu allows enabling and configuration of the SMPTE 2022 / Pro-MPEG COP3 FEC stream to the LAN. Select **Ena/Dis** or **Matrix** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc2 Gigabit Ethernet) Egress → FEC → Ena/Dis

```
Intfc2 Egress FEC:
Enable Disable
```

Select **Enable** or **Disable** using the ◄ ► arrow keys, then press **ENTER**. **Enable** is selected to *generate* SMPTE 2022 / Pro-MPEG COP3 FEC IP packets to the LAN, *in addition to* the stream of IP-encapsulated MPEG packets. **Disable** is selected to *run off* the generation of FEC packets to the LAN.

(CONFIG: Intfc2 Gigabit Ethernet) Egress → FEC → Matrix

```
Intfc2 Egress FEC Matrix:
Length = 10,  Depth = 10
```

To configure the dimension of the egress FEC matrix, first use the ◄ ► arrow keys to select the desired digit to edit, then use the ▲ ▼ arrow keys to change the value of that digit. Press **ENTER** when done.

Valid values for **Length** and **Depth** are as follows:

- **L * D ≤ 100**
- **1 ≤ L ≤ 20**
- **4 ≤ D ≤ 20**

(CONFIG: Intfc2 Gigabit Ethernet) Egress → IP

```
Intfc2 Egress IP:
Group SrcPort DestPort
```

To allow configuration of IP header fields for the egress packets, select **Group**, **ScrPort**, or **DestPort** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc2 Gigabit Ethernet) Egress → IP → Group

```
Intfc2 Egress Multicast:
239.010.010.010   (◄ ► ▲ ▼)
```

To enter a valid destination IP Multicast Group Address for egress IP packets, first use the ◄ ► arrow keys to select the desired digit to edit, then use the ▲ ▼ arrow keys to change the value of that digit. Press **ENTER** when done.

(CONFIG: Intfc2 Gigabit Ethernet) Egress → IP → SrcPort

```
Intfc2 Egress Src Port:
01024             (◄ ► ▲ ▼)
```

To enter a valid UDP Source Port Address for the network, first use the ◄ ► arrow keys to select the desired digit to edit, then use the ▲ ▼ arrow keys to change the value of that digit. Press **ENTER** when done.

(CONFIG: Intfc2 Gigabit Ethernet) Egress → IP → DestPort

```
Intfc2 Egress Multicast:
01024             (◄ ► ▲ ▼)
```

To enter a valid UDP Destination Port Address for the egress packet stream, first use the ◄ ► arrow keys to select the desired digit to edit, then use the ▲ ▼ arrow keys to change the value of that digit. Press **ENTER** when done.

Media packets will be addressed to this UDP port; FEC packets (if FEC generation is enabled) will be addressed to (UDP destination port +2).

(CONFIG: Intfc2 Gigabit Ethernet) Man

```
Intfc2 Management IP
192.168.001.008/24
```

To enter the management IP address/subnet mask for Gigabit Ethernet Interface management channel, first use the ◄ ► arrow keys to select the desired digit to edit, then use the ▲ ▼ arrow keys to change the value of that digit. Press **ENTER** when done.

(CONFIG: Intfc2 Gigabit Ethernet) Stats

```
Intfc2 Statistics
View Clear
```

Select **View** or **Clear** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Intfc2 Gigabit Ethernet) Stats → View

```
FPGA Packets Dropped
0000000000000000000  (▲▼)
```

Table 5-3 lists the viewable statistics for this interface. Use the ▲ ▼ arrow keys to page through the available statistics reports. Press **ENTER** or **CLEAR** when done.

Table 5-3. Statistics for the Gigabit Ethernet Interface

GBEI Statistics Summary		
Category	Message	Description
1000Base-T Link Statistics	LAN Good Octets (In)	The sum of lengths of all good Ethernet frames received from the LAN.
	LAN Bad Octets (In)	The sum of lengths of all bad Ethernet frames received from the LAN.
	LAN Unicast (In)	The sum of good frames received from the LAN that have a unicast destination MAC address.
	LAN Broadcast (In)	The sum of good frames received from the LAN that have a broadcast destination MAC address.
	LAN Multicast (In)	The sum of good frames received from the LAN that have a multicast destination MAC address.
	LAN Pause (In)	The number of good flow control frames received from the LAN.
	LAN Undersize (In)	Total frames received from the LAN with a length of less than 64 octets but with a valid FCS.
	LAN Fragments (In)	Total frames received from the LAN with a length of less than 64 octets and an invalid FCS.
	LAN Oversize (In)	Total frames received from the LAN with a length greater than the maximum size of octets but with a valid FCS.
	LAN Jabber (In)	Total frames received from the LAN with a length greater than the maximum size of octets but with an invalid FCS.
	LAN Rx Err (In)	Total frames received from the LAN for which an error was detected at the PHY.
	LAN FCS Err (In)	Total frames received from the LAN with a CRC error that was not counted in the Fragments or Rx Err totals.
	LAN Octets (Out)	The sum of the lengths of all Ethernet frames transmitted to the LAN.
	LAN Unicast (Out)	The sum of frames transmitted to the LAN that have a unicast destination MAC address.
	LAN Broadcast (Out)	The sum of frames transmitted to the LAN that have a broadcast destination MAC address.
	LAN Multicast (Out)	The sum of frames transmitted to the LAN that have a multicast destination MAC address.

GBEI Statistics Summary		
Category	Message	Description
WAN Port Statistics	WAN Octets (Out)	The sum of the lengths of all Ethernet frames that are forwarded to the WAN.
	WAN Unicast (Out)	The number of good frames with unicast destination MAC addresses that are forwarded to the WAN.
	WAN Broadcast (Out)	The number of good frames with broadcast destination MAC addresses that are forwarded to the WAN.
	WAN Multicast (Out)	The number of good frames with multicast destination MAC addresses that are forwarded to the WAN.
	FPGA Media Received	When FEC is enabled, indicates the number of media packets received by the FEC logic; does not include FEC packets.
	FPGA Media Recovered	When FEC is enabled, indicates number of bad or lost Ethernet packets which have been recovered using FEC.
	FPGA Media Unrecovered	When FEC is enabled, indicates number of bad or lost Ethernet packets that could not be recovered, for which a packet with a payload of null MPEG packets has been substituted.
	FPGA UDP Checksum Error	Indicated number of Ethernet packets received with incorrect UDP checksums.
	FPGA Non-Compliant Pkt	Indicates number of Ethernet packets received which are not valid transport stream packets.
	FPGA Packets Dropped	Indicates number of IP packets that have been dropped due to a buffer overrun condition.
	FPGA Null Underrun	Indicated number of Null MPEG packets generated to the WAN due to buffer underrun conditions.
	FPGA Null Out-of-Sync	Indicates the number of null MPEG packets that have been generated to the WAN due to a loss of (MPEG packet) synchronization condition.
	FPGA Overrun Events	Indicates the number of times that a buffer overrun condition has occurred.
	FPGA Underrun Events	Indicates the number of times that a buffer underrun condition has occurred.
	FPGA Out-of-Sync Events	Indicates the number of times that a loss of MPEG synchronization condition has occurred.
	WAN Good Octets (IN)	The sum of lengths of all good Ethernet frames received from the IP encapsulation logic.
	WAN Unicast (IN)	The sum of good frames received from the WAN IP encapsulation logic that have a unicast destination MAC address.
	WAN Broadcast (IN)	The sum of good frames received from the WAN IP encapsulation logic that have a broadcast destination MAC address.
	WAN Multicast (IN)	The sum of good frames received from the WAN IP encapsulation logic that have a multicast destination MAC address.
Management Port Statistics	Mng Good Octets (In)	The sum of lengths of all good Ethernet frames received from the local GBEI management processor.
	Mng Bad Octets (In)	The sum of lengths of all bad Ethernet frames received from local GBEI management processor.
	Mng Unicast (In)	The sum of good frames received from the local GBEI management processor that have a unicast destination MAC address.
	Mng Broadcast (In)	The sum of good frames received from the local GBEI management processor that have a broadcast destination MAC address.
	Mng Multicast (In)	The sum of good frames received from the local GBEI management processor that have a multicast destination MAC address.
	Mng Pause (In)	The number of good flow control frames received from local GBEI management processor.
	Mng Undersize (In)	Total frames received from the local GBEI management processor with a length of less than 64 octets but with a valid FCS.
	Mng Fragments (In)	Total frames received from the local GBEI management processor with a length of less than 64 octets and an invalid FCS.
	Mng Oversize (In)	Total frames received from the local GBEI management processor with a length greater than the maximum size of octets but with a valid FCS.
	Mng Jabber (In)	Total frames received from the local GBEI management processor with a length greater than the maximum size of octets but with an invalid FCS.
	Mng Rx Err (In)	Total frames received from the local GBEI management processor for that an error was detected by its physical interface.

GBEI Statistics Summary		
Category	Message	Description
Management Port Statistics (cont)	Mng FCS Err (In)	Total frames received from the local GBEI management processor with a CRC error that was not counted in the Fragments or Rx Err totals.
	Mng Octets (Out)	The sum of the lengths of all Ethernet frames transmitted to the local GBEI management processor.
	Mng Unicast (Out)	The sum of frames transmitted to the local GBEI management processor that have a unicast destination MAC address.
	Mng Broadcast (Out)	The sum of frames transmitted to the local GBEI management processor that have a broadcast destination MAC address.
	Mng Multicast (Out)	The sum of frames transmitted to the local GBEI management processor that have a multicast destination MAC address.

5.3.1.7 (CONFIG:) Ref

```
Frequency Reference
External  10 MHz    (◄ ► E)
```

External 10 MHz The unit phase locks to an external input at the BNC connector labeled **EXT REF**. Other selections are available for External 1, 2, 5, 10, or 20 MHz input.

Note: Internal selection is available at 10 MHz.

5.3.1.8 (CONFIG:) Aux

```
Redundancy: Auto/Manual
Ena/Dis  Force(1:1) (◄ ► E)
```

Select **Auto/Manual**, **Ena/Dis** or **Force (1:1)** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG: Aux) Auto/Manual

```
1:1 Modem Switching:
Auto-(On) Manual-(Off) (◄ ►E)
```

Select **Auto-(On)** or **Manual-(Off)** using the ◄ ► arrow keys, then press **ENTER**. Note the following:

- **Auto-(On)** is the default mode of operation. When an online modem is in a fault condition, if the backup modem is not faulted the switch will place the backup modem online.
- Selecting **Manual-(Off)** has the effect of disabling the redundancy switch. If the online modem is in a fault condition, regardless of the fault condition of the backup, no switch will occur.

(CONFIG: Aux) Ena/Dis

```
Redundancy Mode:
Enable  Disable      (◄ ►E)
```

Select **Enable** or **Disable** using the ◄ ► arrow keys, then press **ENTER**. The solid cursor indicates the currently active choice. Select **Enable** to set up the unit for operation with the 1:1 IF switch. Internally, an auxiliary relay sets the alarms connector for the 1:1 operation mode.

Note: Disable is selectable only when the unit is in **Local** mode. When the unit is in **Remote** mode and the user attempts to select **Disable** using the ◄ ► arrow keys, the following message is displayed:

```
    THIS UNIT IS CURRENTLY
       IN REMOTE MODE!!
```

Note: When redundancy is selected, **J5** becomes the default port – **J4** is *not* available for *1:1* operation. Either **J4** *or* **J5** *is* available for *1:N* operation.

(CONFIG: Aux) FORCE(1:1)

```
Press ENT To Force Modem
To Standby  (1:1 Only)
```

The **Force (1:1)** selection is only available for use with a 1:1 switch to force switchover, and only from the modem that is currently *online*. The modem that is *online* is indicated by the **ONLINE** LED on the modem's front panel. As prompted by the display, press **ENTER** to initiate switchover; otherwise, press **CLEAR** to return to the previous menu.

5.3.1.9 (CONFIG:) Alarms

```
Alarm Mask: Tx
Intfc1 Intfc2      (◄ ► E)
```

If the unit is in **Local** mode, select **Tx**, **Intfc1**, or **Intfc2** using the ◄ ► arrow keys, then press **ENTER**.

However, if the unit is in **Remote** mode and the user attempts to select an alarm state, the following message displays:

```
    THIS UNIT IS CURRENTLY
       IN REMOTE MODE!!
```

(CONFIG: Alarms) Tx

```
Tx Alarm Mask: None
```

Currently, masking of Tx Alarms (as associated with the modulator) is not allowed.

(CONFIG: Alarms) Intfc1

```
Intfc1 Alarms:  TxClk
                      (◄ ► E)
```

Select **TxClk** using the ◄ ► arrow keys, then press **ENTER**. The following submenu displays:

```
Intfc1 All Faults:  Alarm
Fault Mask Flt-IFOn   (◄ ► E)
```

Select **Alarm, Fault**, **Masked,** or **Flt-IFOn** using the ◄ ► arrow keys. The available choices define an Interface fault as an **Alarm**, as a **Fault**, or to completely **Mask** the fault. If **Flt-IFOn** is selected, this allows a fault condition to perform a redundancy switch; however output power will be left **on**.

5.3.2 SELECT: Monitor

```
Monitor: Alarms  Rx_Stats
Event-Log
```

Select a submenu from the **Monitor:** menu branch – **Alarms**, **Rx_Stats**, or **Event-Log –** using the ◄ ► arrow keys, then press **ENTER**.

5.3.2.1 (Monitor:) Alarms

```
Live Alarms: Transmit
Receive  Unit   (◄ ► E)
```

Refer to **Table 5-4** for a listing of alarms. Alarms are reported under three main categories:

- **Tx** path alarms are displayed under the **Transmit** category;
- **Rx** path alarms are displayed under the **Receive** category;
- Alarms common to the **Unit** are available under the **Unit** category.

Select **Transmit**, **Receive**, or **Unit** using the ◄ ► arrow keys, then press **ENTER**.

(Monitor: Alarms) Transmit

```
TX Traffic:  GBEI Card
PHY Not Connected   (E)
```

This screen reports only if there are modulator errors; otherwise, it report "**No Errors**." Press **ENTER** or **CLEAR** to return to the previous menu.

NOTE: The alarm message depicted in the above example usually indicates that the Ethernet data cable is disconnected from the modem.

(Monitor: Alarms) Receive

```
RX Traffic:
Demod  Unlocked     (E)
```

This screen reports only if Demod is unlocked; otherwise, it reports "**No Errors**." Press **ENTER** or **CLEAR** to return to the previous menu.

(Monitor: Alarms) Unit

```
Unit Fault: No Errors
                    (E)
```

This screen reports only if there are Unit faults; otherwise, it reports "**No Errors**." Press **ENTER** or **CLEAR** to return to the previous menu.

Table 5-4. Summary of Faults / Alarms (as reported per category)

Transmit (Modulator) Faults / Alarms Category	
Menu Mnemonic	Description
Tx Clock Loss Slot 1	Transmit clock not present at Slot 1
Tx Clock Loss Slot 2	Transmit clock not present at Slot 2
GBEI Card DataRate > +200PPM	Data rate from GBEI to modulator exceeds nominal by >+200PPM
GBEI Card DataRate < -200PPM	Data rate from GBEI to modulator exceeds nominal by <-200PPM
GBEI Card PHY Not Connected	Ethernet cable not connected to GBEI, or cable fault
Tx Ais Interface 1	TX AIS Slot 1 (Valid for G.703)
Tx Ais Interface 2	TX AIS Slot 2()Valid for G.703)
Tx Cable Interface 1	Tx Cable Interface 1
Tx Cable Interface 2	Tx Cable Interface 2
Encoder FIFO Empty	Transmit Encoder FIFO is empty
Encoder FIFO Full	Transmit Encoder FIFO is full
SERDES Parity Errors	SERDES parity errors have been detected
Receive (Demodulator) Faults / Alarms Category	
Menu Mnemonic	Description
+1.5V PSU Demodulator Card	1.5 Vdc regulator exceeds +/- 5%
FPGA Load Demodulator Card	Demod FPGA not loading
Demod Unlocked	Demodulator is not locked
FPGA Temp Demodulator Card	Demod FPGA outside temperature range
BER limit Exceeded	Bit error rate limit exceeded
AGC Level Out of Range	AGC level is out of range
Eb/No limit exceeded	EB/No limit has been exceeded
Demodulator Synth 1 PLL	Demodulator Synth 1 PLL fault
Demodulator Synth 2 PLL	Demodulator Synth 2 PLL fault
Demodulator SERDES Dmd->Framer	Demodulator SERDES fault
Demodulator SERDES Framer > FEC1	Demodulator SERDES fault
Demodulator SERDES Framer > FEC2	Demodulator SERDES fault
FAST option not installed	FAST option for selected feature has not been installed

Rx DCM Unlocked	Demod Digital Clock Manager unlocked
Intf1 Rx Buffer Underflow	Rx buffer has underrun Slot 1
Intff Rx Buffer Overflow	Rx buffer has overflowed Slot 1
Intf2 Rx Buffer Underflow	Rx buffer has underrun Slot 2
Intf2Rx Buffer Overflow	Rx buffer has overflowed Slot 2
SERDES Par Framer -> Intf1	SERDES parity error detected on framer FPGA interface 1
SERDES Par Framer ->Intf2	SERDES parity error detected on framer FPGA interface 2
Rx Clock Source Interface 1	Rx Clock Source fault Interface 1
Rx Clock Source Interface 2	Rx Clock Source fault Interface 2
Intf1 Rx AIS Slot 1 Port1	RX AIS slot1
Intf2 RXAIS Slip Slot 2	RX AIS slot2
Intf1 EXT Clock Slot1	EXT Clock Slot1
Intf2 Clock Slot2	EXT Clock Slot2
Unit Faults / Alarms Category	
Menu Mnemonic	Description
FPGA Load Framer Card	Framer FPGA not loading
+1.5V PSU Framer Card	1.5V Vdc Framer / FEC regulator exceeds +/- 5%
+1.5V PSU Interface Card #1	1.5V Vdc Slot 1 regulator exceeds +/- 5%
+1.5V PSU Interface Card #2	1.5V Vdc Slot 2 regulator exceeds +/- 5%
+3.3V PSU Framer Card	3.3 Vdc Framer regulator exceeds +/- 10%
+5 PSU Framer Card	5.0 Vdc Framer regulator exceeds +/- 10%
+12V PSU Framer Card	12 Vdc Framer regulator exceeds +/- 10%
-12V PSU Framer Card	-12 Vdc Framer regulator exceeds +/- 10%
+18V PSU Framer Card	+18 Vdc Framer regulator exceeds +/- 10%
FLASH Checksum Error	Flash Load Error
FPGA Load Decoder Card	Decoder FPGA not loading
FPGA Load Encoder Card	Encoder FPGA not loading
FPGA Load Interface Card #1	Slot 1 FPGA not loading
FPGA Load Interface Card #2	Slot 2 FPGA not loading
PLL Clock Framer – 192MHz	192MHz PLL Clock Framer failure
PLL Clock Framer – Ext Ref	External Reference PLL Clock Framer failure
FPGA Temp Framer Card	Framing FPGA temperature out of range
Modem Ambient Temp	Framing card (modem) ambient temperature out of range
Modem Cooling Fans	Framing card – sense cooling fan problem
Intfc1 has been removed	Slot 1 interface card removed
Intfc2 has been removed	Slot 2 interface card removed
+1.5V PSU Modulator Card	1.5 Vdc regulator exceeds +/- 5%
FPGA Load Modulator Card	Mod FPGA not loading
PLL Clock Symbol Rate	Mod Symbol Rate defitter PLL unlocked over overflowing
Tx Synth Unlocked	Mod synthesizer unlocked
Tx CDM Unlocked	Mod Digital Clock Manager unlocked
I & Q are inactive	Mod I or Q no activity
FPGA Temp Modulator Card	Mod FPGA outside temperature range
Nyq Filter Clipping	Mod Nyquist filter clipping

5.3.2.2 (Monitor:) Rx_Stats

For DVB-S2 only:

```
EsNo=14.0  PER=0.0E+00
EbNo=12.8  BER=N/A       ▼
```

```
EbNo=12.8  BER=N/A       ▲
ΔF=-000.2k RSL=-16       ▼
```

```
ΔF=-000.2k RSL=-16       ▲
Link_Margin=+10.4
```

When the demodulator is locked, this menu reports Eb/No, PER (packet error rate), ΔF (frequency offset of incoming carrier) and RSL (receive signal level).

For DVB-S and DVB-DSNG only – in this mode, BER monitoring is not available:

```
EsNo=16.0  PER=N/A
EbNo=15.1  BER=0.0E+00   ▼
```

```
EbNo=15.1  BER=0.0E+00   ▲
ΔF=-000.2k RSL=-16       ▼
```

```
ΔF=-000.4k RSL=-16       ▲
Link_Margin=+10.1
```

Link Margin corresponds to:

Standard	Link Margin	Threshold
DVB-S2	= Es/No (measured) – Es/No (threshold)	Table 8-2
DVB-S or DVB-DSNG	= Eb/No (measured) – Eb/No (threshold)	Table 8-4 or 8-5, BER = 10^{10}

Usable Es/No Range (Typical)			
DVB-S2		**DVB-S and DVB-DSNG**	
Modulation	**Es/No Range (dB)**	**Modulation**	**Es/No Range (dB)**
QPSK	0.0 to 14.0	QPSK	2.0 to 16.0
8QPSK	4.5 to 18.5	8 PSK	8.5 to 20.0
16APSK	8.0 to 22.0	16QAM	11.0 to 21.0
32APSK	11.5 to 25.00		

5.3.2.3 (Monitor:) Event-Log

```
Stored Events: View
Clear-All       (◄ ►E)
```

Refer to **Table 5-4** for the listing of available alarms. Select **View** or **Clear-All** using the ◄ ► arrow keys, then press **ENTER**.

(Monitor:) Event-Log → View

```
Log015 23/05/06  09:27:15
Fault – No PHY Link  (▲▼)
```

- This window displays up to 253 Alarms.
- Refer to **Table 5-4** for the listing of available alarms.
- Use the ▲▼ arrow keys to display individual alarms.
- The **Event-Log** stores the live alarms, along with a timestamp for review and troubleshooting. The date is in international format: *dd/mm/yy*

(Monitor: Event-Log) Clear-All

```
Clear All Stored Events:
No  Yes          (◄ ►E)
```

Use the ◄ ► arrow keys to select **No** to retain, or **Yes** to clear the buffer of all stored events, then press **ENTER**.

5.3.3 SELECT: Test

```
Test:
Mode   TestPatterns   (◄ ►E)
```

Test options for the Tx carrier and patterns are selected in this menu. Select a submenu from the **Test:** menu branch – **Mode** or **TestPatterns –** using the ◄ ► arrow keys, then press **ENTER**.

5.3.3.1 (Test:) Mode

```
Test: Normal  RF  IF  I/O
Tx-CW  Tx-1,0     (◄ ► E)
```

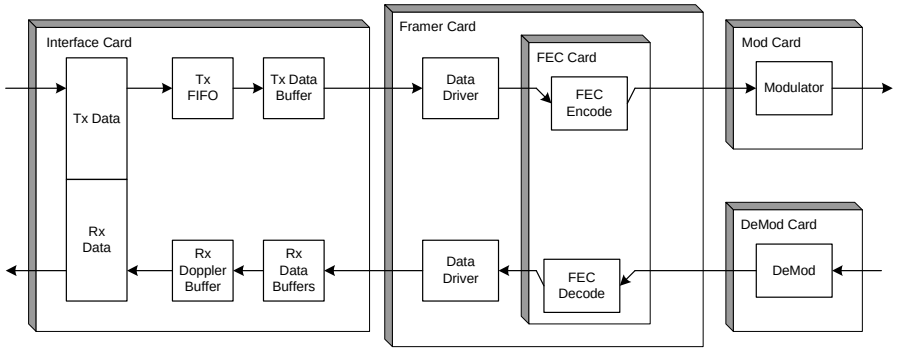
The CDM-710 supports many useful test modes. Not all modes are available in all configurations – they depend upon the modem configuration (Duplex, Rx-Only, Tx-Only) and the data interface(s).

Select **Norm, IF** (Loop)**, I/O** (Loop)**, RF** (Loop)**, Tx-CW** or **Tx-1,0** using the ◄ ► arrow keys, then press **ENTER**.

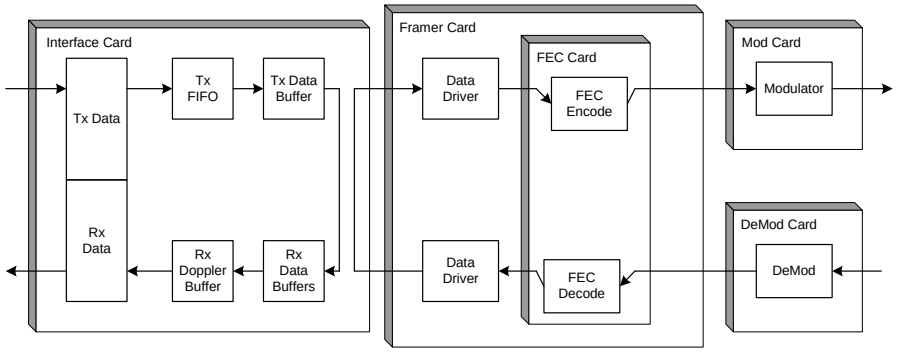
Each test mode option is further explained as follows:

SELECTION	DESCRIPTION
Norm	(Normal) This clears any test modes or loopbacks and places the unit back into an operational state.
IF	(IF Loop) This test mode invokes an internal IF loop. This is a particularly useful feature, as it permits the user to perform a quick diagnostic test without having to disturb external cabling. Furthermore, all of the Rx configuration parameters are temporarily changed to match those of the Tx-side. When Norm is again selected, all of the previous values are restored.
I/O	(Input / Output Loop) This test mode invokes two distinct loopbacks. The first Loopback is an inward loop that takes data being received from the satellite direction, and passes it directly to the modulator. Simultaneously, the outward loop is invoked, whereby data being fed to the Tx data interface is routed directly back out of the Rx data interface.
RF	(RF Loop) This RF loop is almost identical to the IF loop mode. All of the Rx configuration parameters (except Rx Spectrum Invert) are temporarily changed to match those of the Tx-side, however, no internal connection is made. This is useful for performing a satellite Loopback. When Norm is again selected, all of the previous values are restored.
Tx-CW	(Transmit CW) This test mode forces the modulator to transmit a pure carrier (unmodulated).
Tx-1,0	(Tx 1, 0, 1, 0 Pattern) This is a test mode that forces the modulator to transmit a carrier modulated with an alternating 1,0,1,0 pattern, at the currently selected Symbol Rate. This causes single sideband spectral lines to appear, spaced at ± half the Symbol Rate, about the carrier frequency. This mode is used to check the carrier suppression of the Modulator. Also, it verifies quadrature and amplitude balance.

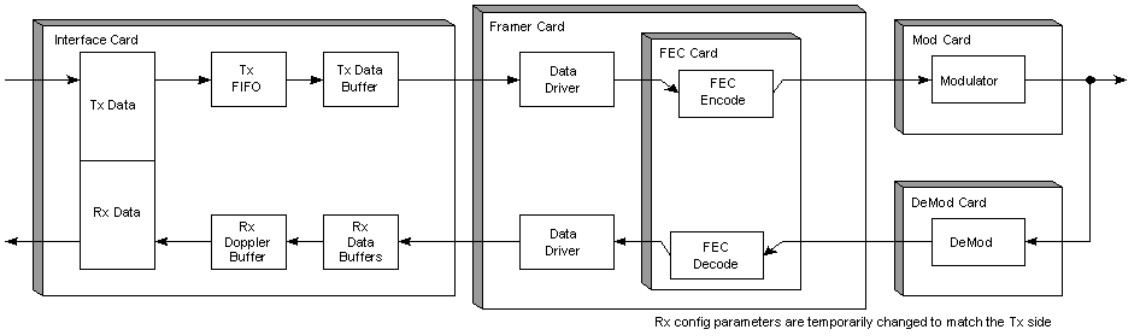
Block Diagrams for the I/O,IF, and RF Loopback Test modes are illustrated in **Figure 5-3**.



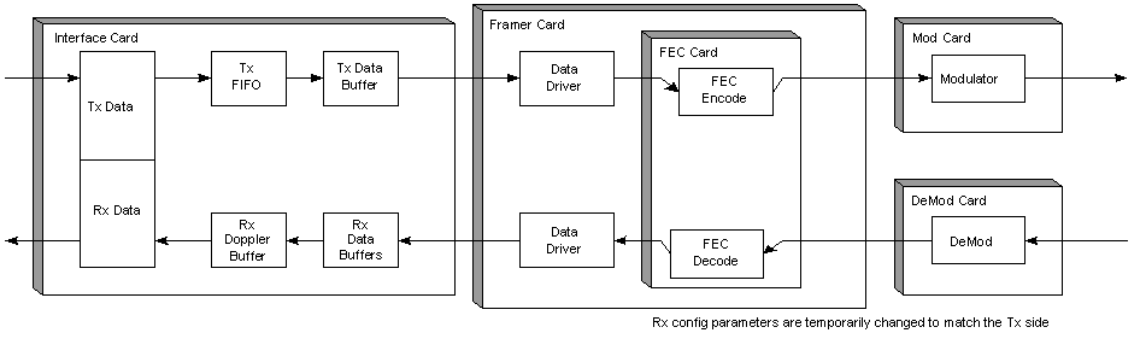
Normal



I/O Loop *(Available Some Interfaces)*



IF Loop *(Not Available For Simplex Operation)*



RF Loop *(Not Available For Simplex Operation)*

Figure 5-3. Traffic Data Flow – Loopback Block Diagrams

5.3.3.2 (Test:) TestPatterns

The availability of test patterns depends on the installed, enabled interface. The example for the menu that is displayed if the CDI-40 ASI interface is installed in Slot 1, or the CDI-70 Gigabit Ethernet Interface is installed in Slot 2, is as follows:

```
Test Pattern Subst:
Off  2047  2^23-1
```

Select **Off**, **2047**, or **2^23-1** using the ◄ ► arrow keys, then press **ENTER**.

If, however, the CDI-60 HSSI Interface is installed and enabled in Slot 1, the following message displays:

```
Test Pattern Subst:
N/A on HSSI Intfc
```

Press **ENTER** or **CLEAR** to return to the previous menu.

5.3.4 SELECT: Info

```
INFO: Rem  Tx  Rx
Intfc1               (◄ ►E)
```

Select a submenu from the **Info:** menu branch – **Rem**, **Tx**, **Rx**, **Intfc1**, or **Intfc2 –** using the ◄ ► arrow keys, then press **ENTER**.

Note: INFO screens provide *read-only* information on the current configuration of the modem without risking inadvertent changes. The user may only view, but not edit, an **Info** screen.

5.3.4.1 (INFO:) Rem

```
Remote M&C: 100BaseTx
IP Addr: 192.168.001.006
```

This display provides the status, as applicable, of the Remote Monitor & Control configuration.

5.3.4.2 (INFO:) Tx

```
Tx: 0140.0000  17.379483
DVBS2 8P 3/4  -10.0 ON
```

Using the example shown, a typical transmit data info screen may be broken down as follows:

Value	Description
Tx: 0140.0000	Tx Frequency in MHz
17.379483	Data rate in Mbps
DVBS2	Transmission mode
8P	*(Modulation:)* QP=QPSK 8P=8-PSK 16A=16-APSK 32A=32-APSK
3/4	Code Rate
-10.0	Tx Power level in dBm
ON	Tx Power: ON = On, OF = Off

5.3.4.3 (INFO:) Rx

```
RX: 0140.0000 17.379483
DVBS2 QP 1/2 LF
```

Using the example shown, a typical receive data info screen may be broken down as follows:

Value	Description
RX: 0140.0000	Rx Frequency in MHz
17.279483	Data rate in Mbps
DVBS2	Transmission mode
8P	*(Demodulation:)* QP=QPSK 8P=8-PSK 16A=16-APSK 32A=32-APSK
1/2	Code Rate
LF	*FECFrame Type:* SF = Short Frame LF = Long Frame

5.3.4.4 (INFO:) Intfc1 (CDI-40 ASI or CDI-60 HSSI Interfaces Only)

The appearance of the Intfc 1 info screen depends on whether a CDI-40 ASI Interface is installed, or a CDI-60 HSSI Interface is installed:

```
Intfc 1: ASI J4  Wide
Tx-188  Rx-188
```

```
Intfc 1: HSSI Tx Rx
188  Rx-Sat
```

For the CDI-40 ASI Interface, the information provided may be broken down as follows:

Value	Description
Intfc 1: ASI	Indicates that the CDI-40 ASI (Asynchronous Serial Interface) per DVB is installed in Slot 1.
J4	Indicates the assigned Tx Data Input Connector as J4 or J5.
Wide	Indicates the assigned Bandwidth Selection ASI (Tx Data) as Wide or Narrow.
Tx-188	Identifies the selected Transport Stream Frame Type as 188 (188 byte frame) or 204 (204 byte frame).
Rx-188	Identifies the selected Transport Stream Frame Type as 188 (188 byte frame) or 204 (204 byte frame).

For the CDI-60 HSSI Interface, the information provided may be broken down as follows:

Value	Description
Intfc 1: HSSI	Indicates that the CDI-60 HSSI (High-Speed Serial Interface) is installed in Slot 1.
Tx	Displays when the Tx side of the interface has been Enabled.
Rx	Displays when the Rx side of the interface has been Enabled.
188	Identifies the selected sync mode/frame type as 188 (188 byte frame) or 204 (204 byte frame).
Rx-Sat	Identifies the selected source that clocks the output of the Rx Buffer, for the purpose of delivering data to the Rx port at the user interface: Rx-Sat, Tx-Terr, or Internal.

5.3.5 SELECT: Save/Load

```
Save/Load Configuration:
Save  Load    (◀ ▶E)
```

The **Save/Load:** menu branch permits the user to store or load up to 10 different modem configurations in an allotted location of the modem's non-volatile memory.

If the unit is in **Local** mode, select a submenu from the **Save/Load:** menu branch – **Save** or **Load –** using the ◀ ▶ arrow keys, then press **ENTER**.

However, if the unit is in **Remote** mode, and the user attempts to select a Save/Load option, the following message is displayed:

```
    THIS UNIT IS CURRENTLY
       IN REMOTE MODE!!
```

5.3.5.1 (Save/Load:) Save

```
Save Config to Loc: 9
Empty          (▲▼ E)
```

*Using **Loc: 9** as the example:* If **Save** is selected and no configuration has been saved, the second line reads '**Empty'**, as shown in the preceding example.

However, if the selected **Loc: 9** already contains data, what displays is similar to the next example:

```
Save Config to Loc: 9
01:02:43  05/08/05   (▲▼ E)
```

The user is shown the time and date stamp of the previously stored configuration, for identification purposes.

Select the location where the current configuration is to be stored using the ▲▼ arrow keys, then press **ENTER**. There are 10 available locations, numbered **0** through **9**.

If the selected location does not contain a previously stored configuration, the following screen is displayed:

```
New Config has been
Saved to Loc 9   (E)
```

However, if the selected location *does* contain a previously stored configuration, the following screen is displayed:

```
Loc 0 Contains Data !
Overwrite? NO YES (◀ ▶E)
```

Select **NO** or **YES** using the ◀ ▶ arrow keys, then press **ENTER**. By selecting **YES**, this serves to overwrite the existing configuration at the selected location.

5.3.5.2 (Save/Load:) Load

```
Load Config from Loc: 9
11:02:43  05/08/05  (▲▼ E)
```

*Using **Loc: 9** as the example:* If **Load** is selected and there is a configuration stored at the selected location, what displays is similar to the preceding example. Note that the stored configuration is identified with a date and time stamp.

If the selected location contains **no** data, what displays is similar to the next example:

```
Load Config from Loc: 9
Empty             (▲▼ E)
```

Select the location from where the current configuration is to be loaded using the ▲▼ arrow keys, then press **ENTER**. There are 10 locations numbered **0** through **9**.

If the selected location contains ***valid*** data, what displays is similar to the following example:

```
New Config has been
Loaded from Loc #      (E)
```

Press **ENTER** or **CLEAR** to return to the previous menu.

If the selected location contains ***invalid*** data, what displays is similar to the next example:

```
Warning! Loc 9 Contains
No Data!               (E)
```

Press **ENTER** or **CLEAR** to return to the previous menu.

5.3.6 SELECT: Util (Utility)

```
UTIL: RT-Clk Ref ID
Display Firmware FAST
```

Select a submenu from the **Util:** menu branch – **RT-Clk**, **Ref**, **ID**, **Display**, **Firmware**, or **FAST** – using the ◄ ► arrow keys, then press **ENTER**.

5.3.6.1 (UTIL:) RT-Clk

```
Edit Real-Time Clock:
10:23:51 23/05/06 (◄ ►▲▼ E)
```

Edit the time and date settings of the real-time clock. Use the ◄ ► arrow keys to select the digit. Use the ▲▼ arrow keys to change the value of that digit, then press **ENTER**.

Note: In accordance with international convention, the date is shown in **DAY/MONTH/YEAR** format.

5.3.6.2 (UTIL:) Ref

```
Internal 10 MHz Ref Freq
Fine Adjust:+1911
```

This menu provides a fine adjustment for the internal 10 MHz reference.

For 'Tx Only' or 'Full Duplex' units, use the Tx IF Carrier to check the reference frequency by first placing the unit in the **Tx-CW** mode from the **Test** menu.

In 'Rx Only' units, 10 MHz is available at J6-8 or J6-9 only while within the (**Util:) Ref** menu.

5.3.6.3 (UTIL:) ID

```
Edit Circuit ID:  (◄ ►▲▼ E)
------------------------
```

To edit the Circuit ID string, select the cursor position on the bottom line using the ◄ ► arrow keys, then edit the selected character using the ▲▼ arrow keys. Note that only the bottom line (0 to 24 characters) is available. The following characters are available:

<Space> ( ) * + - , . / 0-9 and A-Z

Once the string has been composed, press **ENTER**.

5.3.6.4 (UTIL:) Display

```
Edit Display Brightness:
100%   (▲▼ E)
```

Select the brightness level for the VFD as **25%, 50%**, **75%** or **100%** using the ▲▼ arrow keys, then press **ENTER**.

5.3.6.5 (UTIL:) Firmware

IMPORTANT

These commands are for DIAGNOSTIC PURPOSES ONLY. DO NOT CHANGE an image unless instructed to do so by Comtech EF Data customer service technicians.

The options available via the **UTIL: Firmware** submenu allow the user to view information about the CDM-710 internal firmware; additionally, the modem stores two complete firmware images, and the user can select which image will be loaded the next time the unit reboots.

```
Firmware Images:
Info  Select       (◄ ► E)
```

Select **Info** or **Select** using the ◄ ► arrow keys, then press **ENTER**.

(Firmware:) Info

```
Firmware Info: Bootrom
Image#1  Image#2
```

To view information on the Bootrom and the two images, select **Bootrom**, **Image#1**, or **Image#2** using the ◄ ► arrow keys, then press **ENTER** to continue.

(Firmware:) Info → Bootrom

```
Bootrom:            07/17/06
CDM710_Boot            1.1.1
```

This screen provides information on the installed Bootrom firmware. The release date is provided on the top line in **DAY/MONTH/YEAR** format; the bottom line identifies the installed Firmware by its release name/number and its version number (**Note:** The firmware information shown in the preceding example is representative and may differ from what is identified for the unit in use).

Press **ENTER** or **CLEAR** to return to the previous menu.

(Firmware:) Info → Image#1, Image#1

```
Image#X: Bulk   App   Framer
FEC Mod   Demod   Interfaces
```

Where **X** *indicates the selected Image:* On the next page, **Table 5-5** provides an overall summary of examples for each available firmware info screen. As shown, the first column for either Image provides the available selection; the second column provides an example of the information provided for that selection.

Note: The information in this table is representative; the numbers, revision letters, versions, and release dates for the firmware listed in this table are subject to change.

(Firmware:) Select

```
Current Active Image: #2
Next Reboot Image: #1 #2
```

The top line shows the active image. To select the active software image, on the second line, select the desired image using the ◄ ► arrow keys, then press **ENTER**.

To make the selected image the active choice, power cycle the modem to reboot using the selected software image.

Table 5-5. Summary of Firmware Info Screens (Image#1 and Image#2)

Utility: Firmware → Info → Image#1	
Image#1:	Bulk App Framer FEC Mod Interfaces
Bulk	Bulk: 08/06/09 FW12437P 4.1.5
App	App: 08/06/09 FW12438P 4.1.5
Framer	Framer: 11/08/07 FW12548C 2.3.2
FEC	Enc-S2 Enc-S Dec-S2
FEC: Enc-S2	DVB-S2 Enc 03/13/09 FW12439C 1.2.1
FEC: Enc-S	DVB-S Enc 04/03/07 FW12440A 1.0.2
FEC: Dec-S2	DVB-S2 Dec 12/12/07 FW12436B 1.1.3
Mod	Filters FPGA
Mod: Filters	Mod Filters: 11/23/05 FW12695- 1.1.1
Mod: FPGA	Mod FPGA 09/12/07 FW12549B 2.2.1
Demod	Filters UDD Equalizer
Demod: Filters	Dem Filters: 08/27/06 FW12694- 1.1.1
Demod: UDD	UDD FPGA: 06/12/07 FW12442C 2.4.0
Demod: Equalizer	EQ FPGA: 06/28/07 FW12441- 1.3.0
Interfaces	ASI GBEI HSSI
Intfc: ASI	ASI: 07/25/07 FW12546D 2.2.1
Intfc: GBEI Note 2	GBEI: 12/04/08 FW/12738B 1.1.10
Intfc: HSSI	HSSI: 11/02/07 FW0000024A 1.0.1
Intfc2: GBEI Note 2 (Slot 2 only)	GBEI: 6/26/07 FW12738A 1.1.9

Utility: Firmware → Info → Image#2	
Image#2	Image#2: Bulk App Framer FEC Mod Interfaces
Bulk	Bulk: 08/06/09 FW12437P 4.1.5
App	App: 08/06/09 FW12438P 4.1.5
Framer	Framer: 11/08/07 FW12548C 2.3.2
FEC	Enc-S2 Enc-S Dec-S2
FEC: Enc-S2	DVB-S2 Enc 03/13/09 FW12439C 1.2.1
FEC: Enc-S	DVB-S Enc 04/03/07 FW12440A 1.0.2
FEC: Dec-S2	DVB-S2 Dec 12/12/07 FW12436B 1.1.3
Mod	Filters FPGA
Mod: Filters	Mod Filters: 11/23/05 FW12695- 1.1.1
Mod: FPGA	Mod FPGA 09/12/07 FW12549B 2.2.1
Demod	Filters UDD Equalizer
Demod: Filters	Dem Filters: 08/27/06 FW12694- 1.1.1
Demod: UDD	UDD FPGA: 06/12/07 FW12442C 2.4.0
Demod: Equalizer	EQ FPGA: 06/28/07 FW12441- 1.3.0
Interfaces	ASI GBEI HSSI
Intfc: ASI	ASI: 07/25/07 FW12546D 2.2.1
Intfc: GBEI Note 2	GBEI: 12/04/08 FW/12738B 1.1.10
Intfc: HSSI	HSSI: 11/02/07 FW0000024A 1.0.1

Notes:

1. The following information is representative. Current status is obtained via the **Firmware Info: → Image#***x* submenus.
2. The firmware for the CDI-70 Gigabit Ethernet Interface (GBEI) is installed on the interface itself; information is returned only when a CDI-70 module is installed in Slot 2.

5.3.6.6 (UTIL:) FAST

```
FAST: Cnfg   View
MainBoard S/N: 333333333
```

Comtech EF Data's FAST (Fully Accessible System Topology) system permits the purchase and installation of options through special authorization codes, entered remotely or through the front panel. FAST allows immediate implementation of different options through the user interface keypad. All FAST options are available through the basic platform unit.

Select **Cnfg** or **View** using the ◄ ► arrow keys, then press **ENTER**.

(FAST:) Cnfg (Configuration)

```
FAST Configuration
Edit Code  Demo Mode
```

Select **Edit Code** or **Demo Mode** using the ◄ ► arrow keys, then press **ENTER**.

(FAST:) Cnfg → Code

```
Edit 20 digit FAST Code:
00000000000000000000 ENT
```

Enter the code ***carefully*** on the bottom line by using the ◄ ► arrow keys to move to each character position, then editing the character in that position by using the ▲▼ arrow keys. Once the 20-digit FAST Code is correctly compiled, press **ENTER**.

The CDM-710 responds with "**Configured Successfully**" if the new FAST option is accepted. If, however, the code as entered is *not* accepted, the following message displays:

```
Fast Code Rejected!
       (ENTER OR CLEAR)
```

Re-enter the code using the previously described code entry procedure. Should the message display again, contact Comtech EF Data Customer Support for further assistance.

(FAST:) Cnfg → Demo Mode

```
FAST Demo Mode: Off On
3888000 seconds remain
```

The **Demo Mode** enables all FAST options for a limited time. For newer units with the latest firmware version, the **Demo Mode** lasts 45 days.

Select **Off** or **On** using the ◄ ► arrow keys, then press **ENTER**. The display indicates the time remaining on the demo counter. The demo time may be paused either by turning demo mode off, or by unplugging the unit. However, whenever the unit is turned back on, the demo counter will resume.

(UTIL:) FAST → View

```
View Options: 01     (▲▼)
IF Modulator     Installed
```

Scroll through the available option number, displayed on the top line, using the ▲▼ arrow keys. The description of each option and its installation status (**Installed** or **Not Installed**) appears on the lower line of the display. Note the following:

Option Number (top line)	Description (bottom line)
01	IF Modulator (for CDM-710 70/140 MHz units) L-Band Mod (for CDM-710L L-Band units)
02	IF Demodulator (for CDM-710 70/140 MHz units) L-Band Demod (for CDM-710L L-Band units)
03	FEC Slot 1
04	FEC Slot 2
05	Interface #1
06	GBEI Intf2
07	Tx QPSK
08	Tx 8PSK
09	Tx 16-QAM
10	Tx 16APSK
11	Tx 32 APSK
12	Rx QPSK
13	Rx 8PSK
14	Rx 16QAM
15	Rx 16APSK
16	Rx 32 APSK
17	Tx <=15.0 MS
18	Tx <=22.5 MS
19	Tx <=30.0 MS
20	Tx <=37.5 MS
21	Tx <=45.0 MS
22	Rx <=15.0 MS
23	Rx <=22.5 MS
24	Rx <=30.0 MS
25	Rx <=37.5 MS
26	Rx <=45.0 MS
27	Tx DVB-S1
28	Tx DVB-S2
29	Tx DVB-DSNG
30	Rx DVB-S1
31	Rx DVB-S2
32	Rx DVB-DSNG

Note: This listing of FAST options is representative and is subject to change.

Notes:

Chapter 6. ETHERNET MANAGEMENT

6.1 Introduction

The CDM-710 base modem is equipped with an RJ-45 10/100 Base-T Ethernet management interface used for monitor and control purposes.

This chapter provides information for the functionality provided by this interface, and references other chapters in this manual for further details.

6.2 Ethernet Management Interface Protocols

The modem 10/100 Base-T Ethernet Management Interface supports three (3) different management protocols:

- SNMP with public and private MIB – refer to **Sect. 6.3**;
- Telnet interface for remote product M&C – refer to **Sect. 6.4**;
- Web Server interface for complete product management – refer to **Sect. 6.5**.

6.3 SNMP Interface

The *Simple Network Management Protocol* (SNMP) is an application-layer protocol designed to facilitate the exchange of management information between network devices. The CDM-710 SNMP agent supports both SNMPv1 and v2c.

IMPORTANT

For proper SNMP operation, the CDM-710 MIB files must be used with the associated version of the CDM-710 modem M&C. Please refer to the CDM-710 FW Release Notes for information on the required FW/SW compatibility.

6.3.1 Management Information Base (MIB) Files

MIB files are used for SNMP remote management and consist of Object Identifiers (OIDs). Each OID is a node that provides remote management of a particular function. A MIB file is a tree of nodes that is unique to a particular device.

The following MIB files are associated with the CDM-710:

MIB File/Name	Description
FW10874-2-.mib ComtechEFData Root MIB file	ComtechEFData MIB file gives the root tree for ALL Comtech EF Data products and consists of only the following OID: Name: comtechEFData Type: MODULE-IDENTITY OID: 1.3.6.1.4.1.6247 Full path: iso(1).org(3).dod(6).internet(1).private(4).enterprises(1).comtechEFData(6247) Module: ComtechEFData
FW12438-2B.mib CDM-710 Common MIB file	CDM-710 High Speed modem family common components.
Fw12051-4-.mib CDM-710-Modulator MIB file	CDM-710 High Speed modem family Modulator components.
Fw12051-5-.mib CDM-710 ASI MIB file	CDM-710 High Speed modem family ASI interface components.
Fw12051-6-.mib CDM-710 REDUNDANCY MIB file	CDM-710 High Speed modem family 1:1 Redundancy components.
FW12438-3A.mib CDM-710 Traps MIB file	CDM-710 High Speed modem family Trap MIB file is provided for SNMPv1 traps
Fw12051-8-.mib CDM-710 Gigabit Ethernet Interface MIB file	CDM-710 High Speed modem family Gigabit Ethernet MIB file is provided for SNMPv1 traps

These MIB files should be compiled in a MIB Browser or SNMP Network Monitoring System server.

Note: The SNMP agent supports both "**SNMPv1"** and "**v2c"**. The "**Traps"** file only needs to be compiled if "**SNMPv1"** traps are to be used.

6.3.1.1 Common Private MIBs

The CDM-710 SNMP agent also implements four private MIBs. The CDM-710 Common MIB holds all unit parameters not associated with Modulator, Demodulator, FEC, or Interface boards. For detailed OID information please refer to the actual MIB file.

Name	Description
System Information Group	This group provides Serial Number and Model Number information as well as an interface table that defines the exact hardware configuration of the unit.
Remote Serial Group	This group provides the parameters of the modem's legacy Serial interface. This includes the Local/Remote State, Physical Interface (RS-232 or RS-485), Address and baud rate selections. In addition, this group provides address selection for the 1:1 redundancy controller.
Remote Ethernet Group	This group provides the parameters of the modem's Ethernet interface. This includes the IP Address and Mask, IP Gateway, and MAC Address.
Ethernet SNMP Group	This group provides the parameters necessary to configure and operate the SNMP interface. This includes the System Name, Administrator and Location as well as the Community Strings.
Interface FEC Group	This group provides information regarding unit's two FEC Slots and the capabilities of the cards loaded in those slots.
Modem Reference Group	This group provides the parameters for selection of the modem's frequency reference.
Monitor Group	This group provides access to the units current Alarm/Fault Status as well as a table to access the Stored Alarms/Events.
Test Group	This group provides access to the units test modes.
Save/Load Group	This group provides control of the unit's configuration Store and Load capabilities.
Utilities Group	This group provides access to the unit's Real-Time clock (Time and Date), Internal Reference Adjustment, Circuit ID, and Front Panel Display Brightness Control.
Firmware Group	This group provides a table of firmware numbers, Revision Numbers, and Release Dates for all the software/firmware within the unit.

6.3.1.2 Modulator Private MIB

The CDM-710 Modem MIB holds all unit parameters associated with the Modulator. For detailed OID information please refer to the actual MIB file.

6.3.1.3 ASI Private MIB

The CDM-710 ASI MIB holds all unit parameters associated with the ASI interface board. For detailed OID information please refer to the actual MIB file.

6.3.1.4 Redundancy-Switch Private MIB

The CDM-710 Modem MIB holds all unit parameters associated with 1:1 Redundancy operations. For detailed OID information please refer to the actual MIB file.

6.3.1.5 Gigabit Ethernet MIB

The CDM-710 Modem MIB holds all unit parameters associated with the Gigabit Ethernet Interface. For detailed information, refer to the actual MIB file.

6.3.1.6 HSSI MIB

SNMP for the HSSI interface is not supported at this time.

6.3.2 SNMP Community Strings

The CDM-710 uses community strings as a password scheme that provides authentication before gaining access to the modem agent's MIBs.

In "**SNMP v1/v2c"**, the community string is sent unencrypted in the SNMP packets. Caution must be taken by the network administrator to ensure that SNMP packets travel only over a secure and private network if security is a concern. A packet sniffer can easily obtain the community string by viewing the SNMP traffic on the network.

The community string is entered into the MIB Browser or Network Node Management software and is used to authenticate users and determine access privileges to the SNMP agent.

The user defines three Community Strings for SNMP access:

- Read Community default = public
- Write Community default = private
- Trap Community default = comtech

6.3.3 SNMP Traps

The CDM-710 has the ability to send out SNMP traps when certain events occur in the modem. For example, the modem sends out traps when an alarm or a fault occurs in the modem. These include Unit faults, Tx faults, Rx faults, and ODU faults. A trap is sent both when a fault occurs and when a fault is cleared.

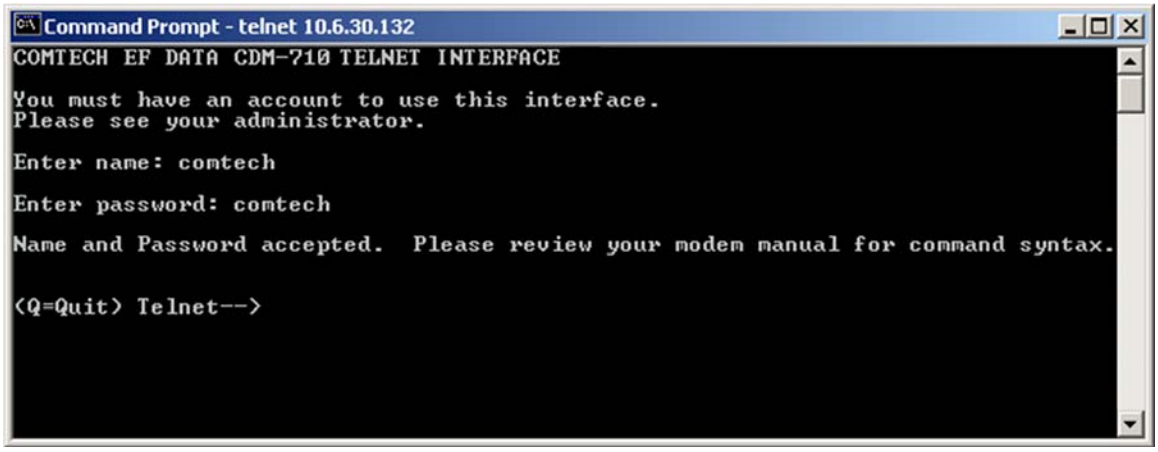
6.4 Telnet Interface

The modem provides a Telnet interface for the purpose of Equipment M&C via the standard The CDM-710G High-Speed Satellite Modem provides a Telnet interface for two primary functions:

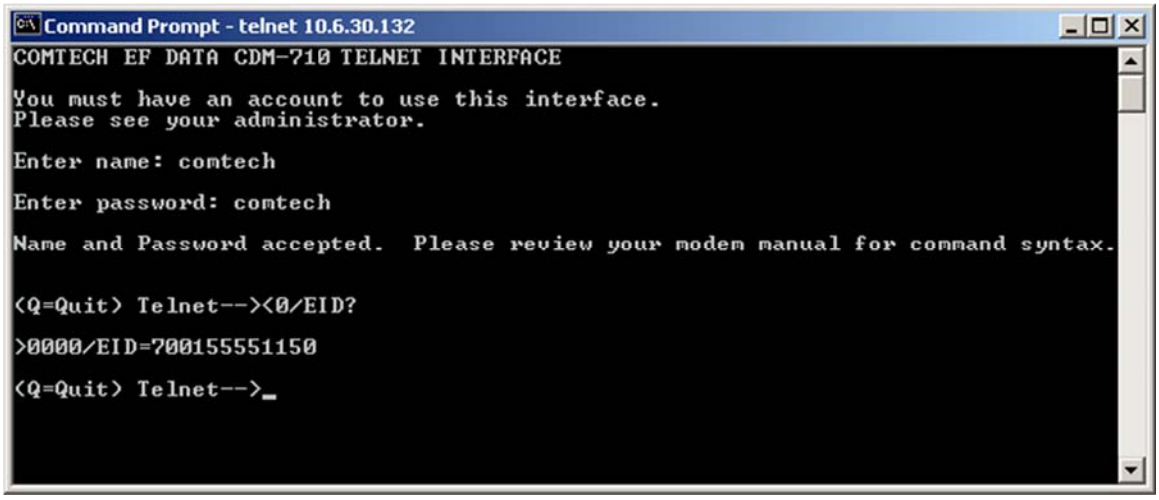
- Equipment M&C via the standard equipment Remote Control protocol.
- Equipment M&C via Comtech Monitor and Control System (CMCS) application.

The Telnet interface requires user login at the **Administrator** level and **Read/Write** level.

The login process is shown in the following example:



Once logged into the Telnet interface as the Administrator, the user can access the standard remote control interface defined in **Appendix A. REMOTE CONTROL**, as shown in this example:



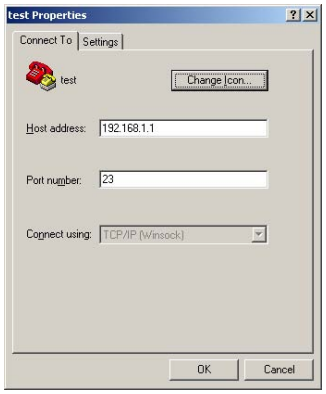
6.4.1 Caution Using Windows Telnet Client

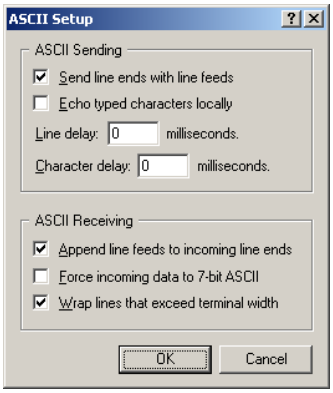
There is a disadvantage when using Windows Command-line as Telnet Client. Since this interface cannot translate a '\r' to a '\r\n' for the messages coming from Telnet Server, the multi-line command

response (for example, FRW? response) will be displayed as one line, with the latter lines overwriting the previous lines.
In order to view the full response messages, CEFD recommends using HyperTerminal configured as Telnet Client. To do so, configure HyperTerminal as follows:

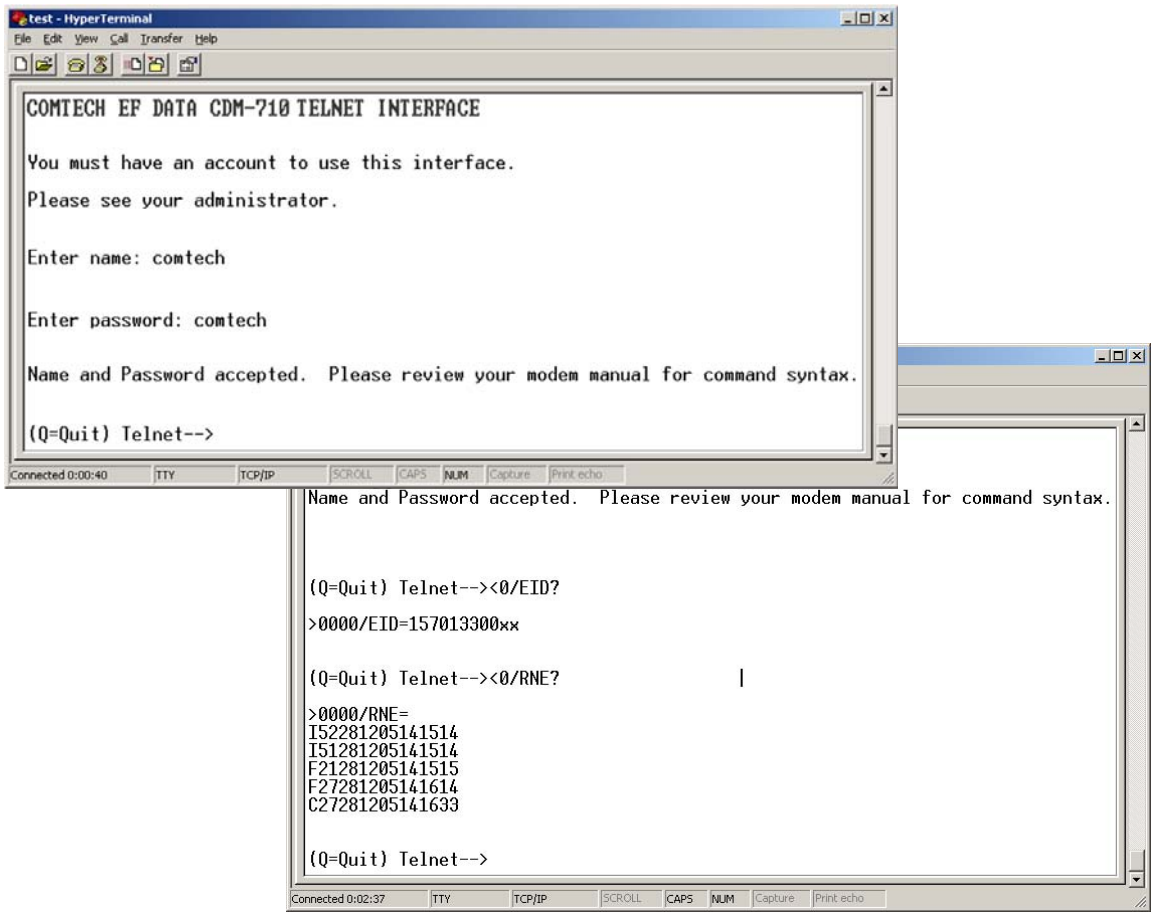
1. Ensure that connection is made using **TCP/IP (Winsock)** instead of COM1 or COM2, as shown in the example to the near right.

2. ASCII Setup (File → Properties → Settings → ASCII Setup): Check the "**Send line ends with line feeds**" option in the *ASCII Sending* section and the "**Append line feeds to incoming line ends**" option in the *ASCII Receiving* section, as shown in the example to the far right.





Login and remote command execution via HyperTerminal configured as Telnet Client appears as per the following examples:



6.4.2 Using Telnet

Refer to **Appendix A. REMOTE CONTROL** in this manual for the syntax and list of commands and status queries for the modem. Telnet is implemented in the modem Ethernet M&C in a "Telnet wrapper". When the user Telnets to the modem, it emulates a local RS-232 (RS-485) serial connection to the modem. The user can then type the same command syntax as would be used from a serial remote terminal, and the Ethernet M&C "unwraps" the Telnet packet and sends it on to the base modem processor – which responds to it as if it was a serial remote command.

To summarize:

- Start of Packet is either a '<' or a '>' where '<' is used to send a command/query to the modem and '>' is the modem response.
- Defines the address of the modem (always is 0 in RS-0232).
- The 3 digit instruction code of the specific command/query.
- Instruction Code Qualifier. When sending, = will set a parameter, ? is used to query.
- The modem response will be either =, ?, !, *, #, or ~ (see the specific definitions in the Remote Control Section).
- Optional argument.
- End of packet (CR).

6.4.3 Telnet Examples

1. A controller sends the following command to the modem to program its Tx frequency:

   <0135/TFQ=0070.2345 {CR}

   The modem returns:

   >0135/TFQ=

2. The message below requests Tx frequency status:

   <0654/TFQ?

   The modem response is:

   >0654/TFQ= 0070.2345 {CR}{LF}

6.5 Web Server (HTTP) Interface

This section describes the functionality of the CDM-710 Broadcast Satellite Modem Web Server (HTTP) Interface. Please refer to **Chapter 5. FRONT PANEL OPERATION**, and the Remote Commands Specifications tables found in **Appendix A. REMOTE CONTROL** for detailed descriptions of the configuration parameters featured on the individual Web pages shown in this chapter.

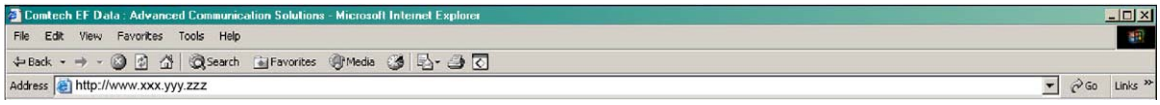
6.5.1 Web Server Interface Introduction

The embedded Web Server application provides the user with an easy to use interface to configure and monitor all aspects of the CDM-710. These Web pages have been designed for optimal performance when using Microsoft's Internet Explorer Version 5.5 or higher (the examples shown use Internet Explorer Version 6.0).

The user can fully control and monitor base operations of the CDM-710 from the Web Server Interface. By rolling the cursor over the navigation tabs located at the top of each page (right), the user can select from the available nested hyperlinks.

6.5.2 User Login

To initiate a Web session with the CDM-710 Broadcast Satellite Modem, from the PC type *http://www.xxx.yyy.zzzz* (where "*www.xxx.yyy.zzz*" represents the IP address of the CDM-710) into the **Address** area of the Web browser:



The Login window will appear, and the user is prompted to type a User Name and Password.

CDM-710 Satellite Modem Web Server Default Name/Passwords are:

Admin	comtech/comtech
Read/Write	opcenter/1234
Read Only	monitor/1234

User Interface	User Login Access Level		
	Admin User	Read/Write User	Read Only User
Web	Full Access to all Web Pages	No Access to Admin or Encryption Web pages	No Access to Admin or Encryption Web pages
		Full Access for all other Web Pages	View Only Access for all other Web Pages

Type the User Name and Password, then click **[OK].**

6.5.3 Web Server Menu Tree

Once the valid User Name and Password is accepted, the user will see the CDM-710 Broadcast Satellite Modem Web Server Interface "splash" page (**Figure 6-1**). From this top level menu, the user has access to five (5) navigation tabs and various nested pages accessible via hyperlink, as depicted by the following menu tree:

Home	Admin	Config	Stats	Maint
Home	Access	Interface	Modem Status	Unit Info
Contact	SNMP	Modem	Events & Statistics	
Support		Modem Utilities		

Click any tab to continue.

6.5.4 Web Server Page Descriptions

Refer to the following subsections in this chapter for further information about each page available under the tabs that comprise the Web Server Interface:

Interface Tab	Refer to:
Home	**Sect. 6.5.4.1**
Admin (Administration)	**Sect. 6.5.4.2**
Config Mdm (Modem Configuration)	**Sect. 6.5.4.3**
Stats (Status/Statistics)	**Sect. 6.5.4.4**
Maint (Maintenance)	**Sect. 6.5.4.5**

For a complete and detailed description of each configuration parameter available via each page under this interface, refer elsewhere in this manual to **Chapter 5. FRONT PANEL OPERATIONS** or **Appendix A. REMOTE CONTROL**.

6.5.4.1 Home Page

6.5.4.1.1 Home | Home ("Splash") Page

Figure 6-1. CDM-710 Home ("Splash") page

From any location within the Web Server Interface, the user can select the **Home** tab and/or hyperlink to return back to this top-level page.

6.5.4.1.2 Home | Contact Page

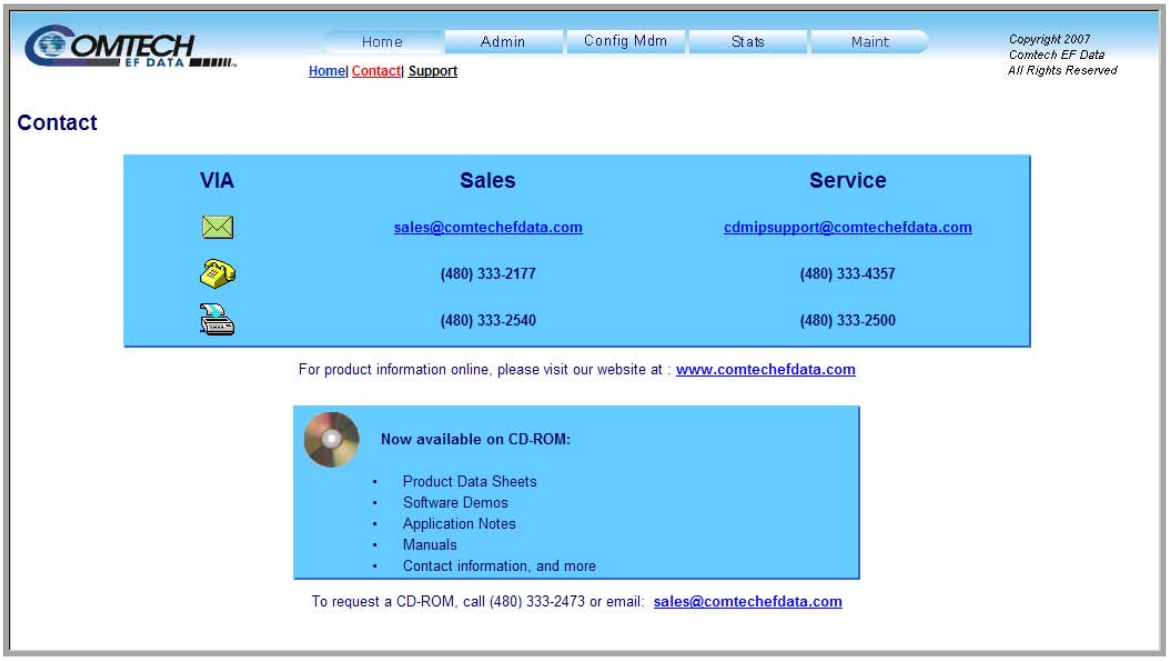


Figure 6-2. Home | Contact page

The '**Contact'** page (**Figure 6-2**) provides basic contact information to reach Comtech EF Data Sales and Customer Support via phone or automated e-mail links.

6.5.4.1.3 Home | Support Page

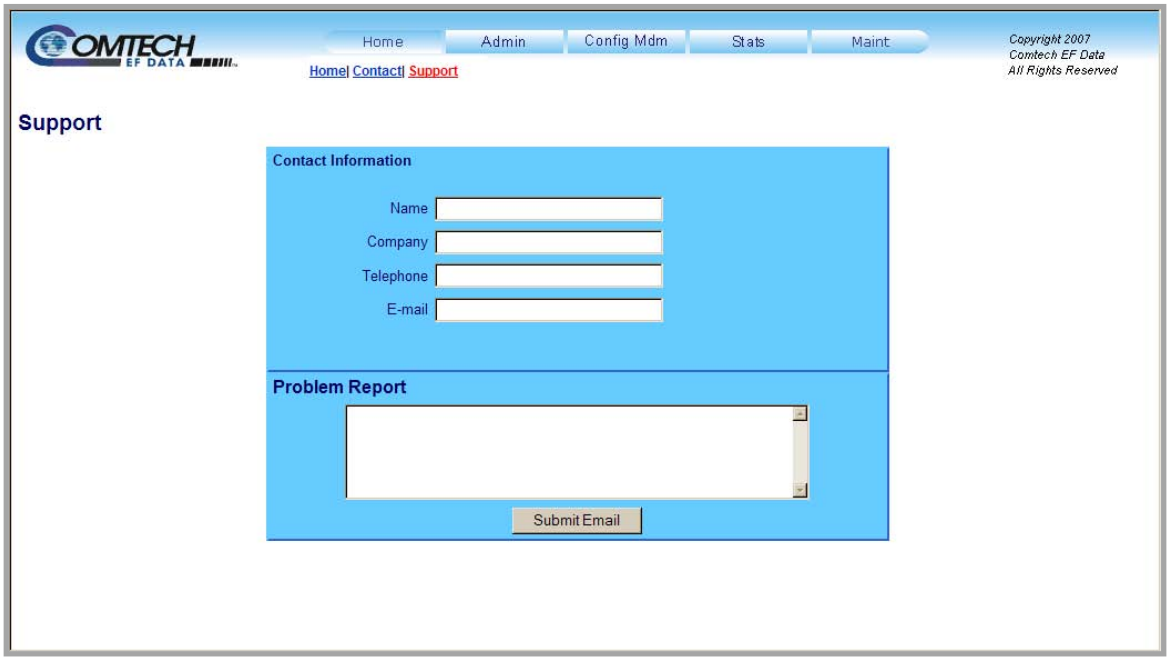


Figure 6-3. Home | Support page

The CDM-710 '**Support'** page (**Figure 6-3**) allows the user to compose an e-mail message for questions or problems with the modem.

The **Problem Report** area of the display allows up to 256 characters maximum.

The CDM-710 Support Web Page uses SMTP (Simple Mail Transport Protocol) to send e-mail to Comtech EF Data Modem Support (cdmipsupport@comtechefdata.com).

IMPORTANT

For this page to operate correctly, the modem's administrator is required to specify the SMTP server, domain name, and destination on the* Admin | Access *page (see Sect. 6.5.4.2.1).

Once the **Contact Information** is entered and a message composed in the **Problem Report** text window, click [**Submit Email]** to send the message.

6.5.4.2 Admin Pages

The '**Admin'** pages provide the means to set up the access parameters required to facilitate communication with the CDM-710 Web Server.

IMPORTANT

The Admin pages are available only to users who have logged in using the Administrator Name and Password.

6.5.4.2.1 Admin | Access Page

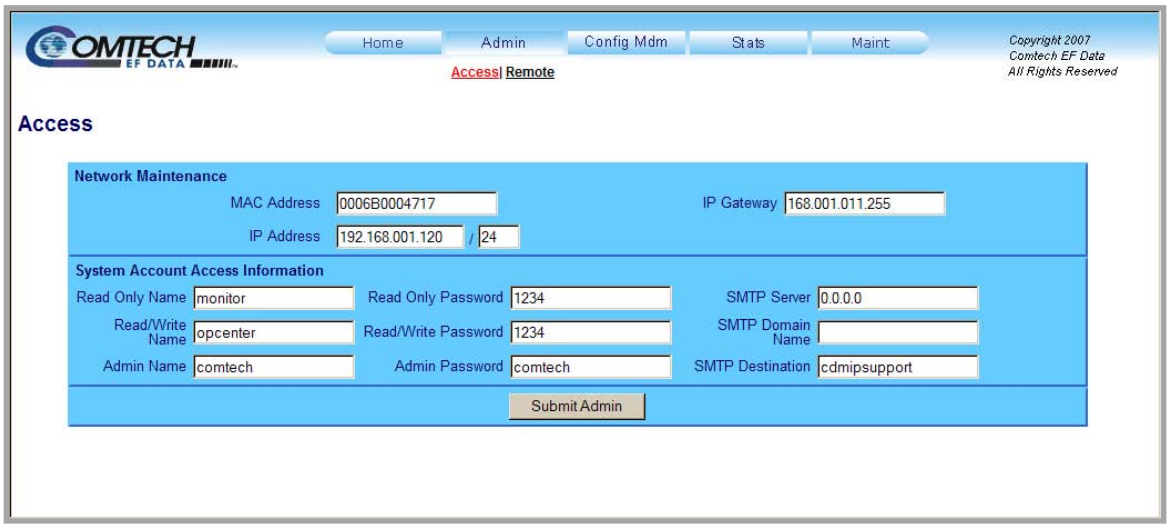


Figure 6-4. Admin | Access page

The '**Admin | Access'** page (**Figure 6-4)** provides the means to set up user names, passwords, the e-mail server, and the host IP addresses to facilitate communication with the CDM-710 Web Server.

Network Maintenance

- **MAC Address:** This parameter is ***read-only*** and cannot be changed.
- **IP Gateway:** This entry allows a user to specify the IP Gateway Address for the Ethernet M&C port for this unit.
- **IP Address:** This entry allows a user to specify an IP address and a subnet mask to define a unique class of machines that are allowed access.

System Account Access Information

- **Admin, Read/Write, Read Only Names and Passwords:**

  The factory defaults for these names/passwords are:

  - **Admin** comtech/comtech
  - **Read/Write** opcenter/1234
  - **Read Only** monitor/1234

Note the following:

- These **Name** fields can be any alphanumeric combination with a maximum length of 10 characters.
- These **Password** fields can be any alphanumeric combination with a maximum length of 10 characters.

- **SMTP Server:** Specify the mail server IP address from where you want to send the e-mail.
- **SMTP Domain Name / Destination:** The Administrator can assign the SMTP Domain Name and Destination. This is required if the e-mail feature of the Support Page (Sect. 6.5.4.1.3) is to be used.
  - For **SMTP Domain Name**, specify the domain of the e-mail server (usually found to the right of the @ symbol in an e-mail address).
  - For **SMTP Domain Destination**,specify the e-mail recipient name (usually found to the left of the @ symbol in an e-mail address).

Once the desired configuration settings have been made on this page, click [**Submit Admin]** to save these changes.

6.5.4.2.2 Admin | Remote Page

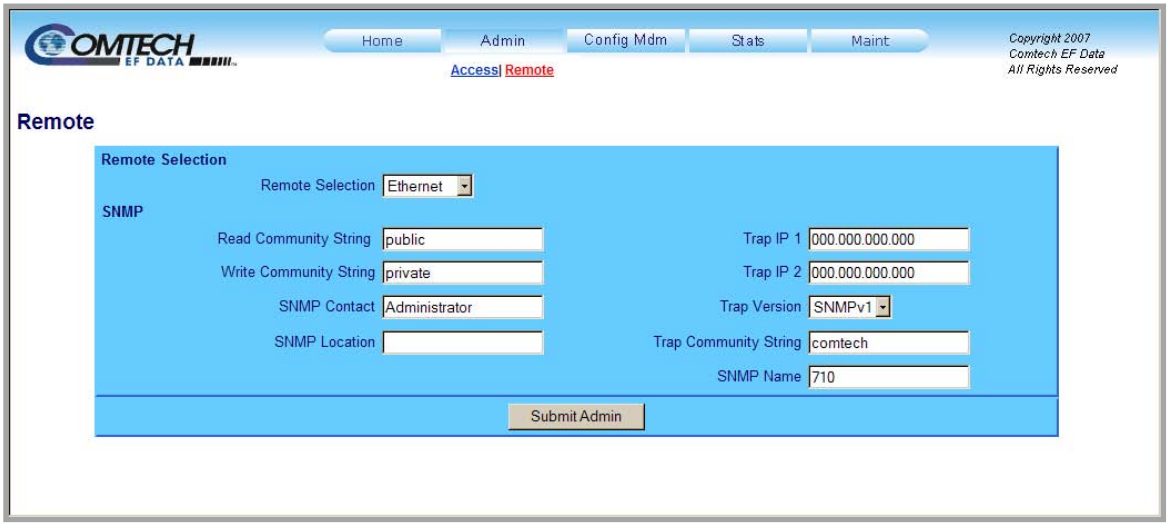


Figure 6-5. Admin | Remote page

The '**Admin | Remote'** page (**Figure 6-5**) sets and returns administration information for the CDM-710 Simple Network Management Protocol (SNMP) feature.

The Administrator can assign up to two **SNMP Trap** IP addresses.

The Administrator can assign a **SNMP Trap Community String**. The factory default for this parameter is **public**. The SNMP Trap Community String field can be any combination of characters and a length of 0 - 20 characters.

For details pertaining to the configuration parameters available on this page, refer to **Chapter 5. FRONT PANEL OPERATION** and **Sect. 6.3 SNMP INTERFACE**.

Once the desired configuration settings have been made on this page, the user should then click [**Submit Admin]** to save these changes.

6.5.4.3 Config Mdm (Configure Modem)

The '**Config Mdm**' pages (**Figure 6-6** through **Figure 6-9**) are used to configure all modem parameters.

6.5.4.3.1 Config Mdm | Interface

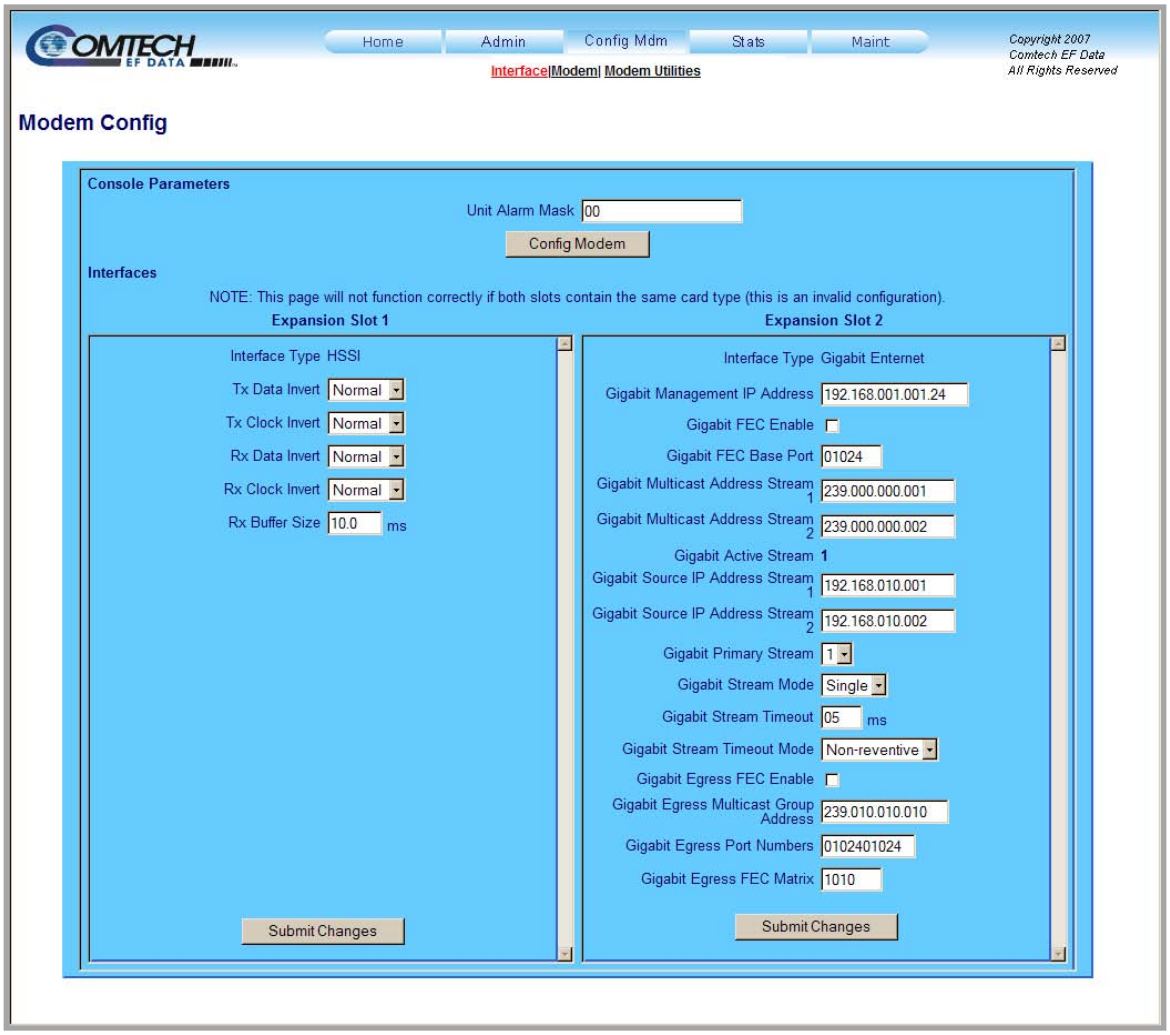


Figure 6-6. Config Mdm | Interface page

Use the '**Config Mdm | Interface**' page (**Figure 6-6**) to configure the modem's installed data interfaces. The appearance of this page is dependent on the interfaces installed in Expansion Slot 1 (Intfc1) and Expansion Slot 2 (Intfc2). In the above example, a CDI-60 HSSI Interface Module has been installed in Expansion Slot 1, and a CDI-70 Gigabit Ethernet Interface (GBEI) Module has been installed in Expansion Slot 2 (for a table of the applicable interfaces and installable combinations, refer to **Sect. 1.3.5 Allowable Data Interface Combinations**).

For either slot, the modem automatically detects the interface present and adjusts the appearance of this page accordingly. If needed, define the desired interface operating parameters, then click [**Submit Changes]** to save these changes.

If there is no interface module present, as shown in **Figure 6-7** the message "**Interface Not Installed.**" is displayed in place of an operable configuration window. In this example, a CDI-40 ASI Interface Module has been installed in Expansion Slot 1, while Expansion Slot 2 is empty:

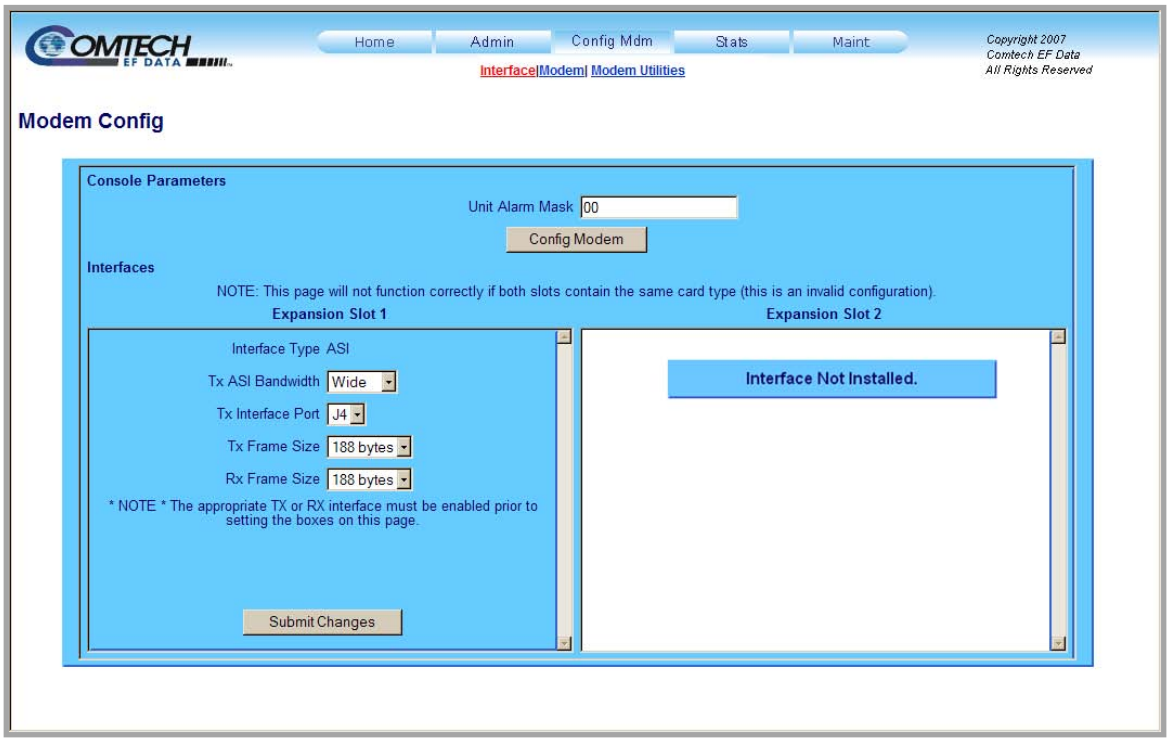


Figure 6-7. Config Mdm | Interface page (with Empty Slot)

6.5.4.3.2 Config Mdm | Modem

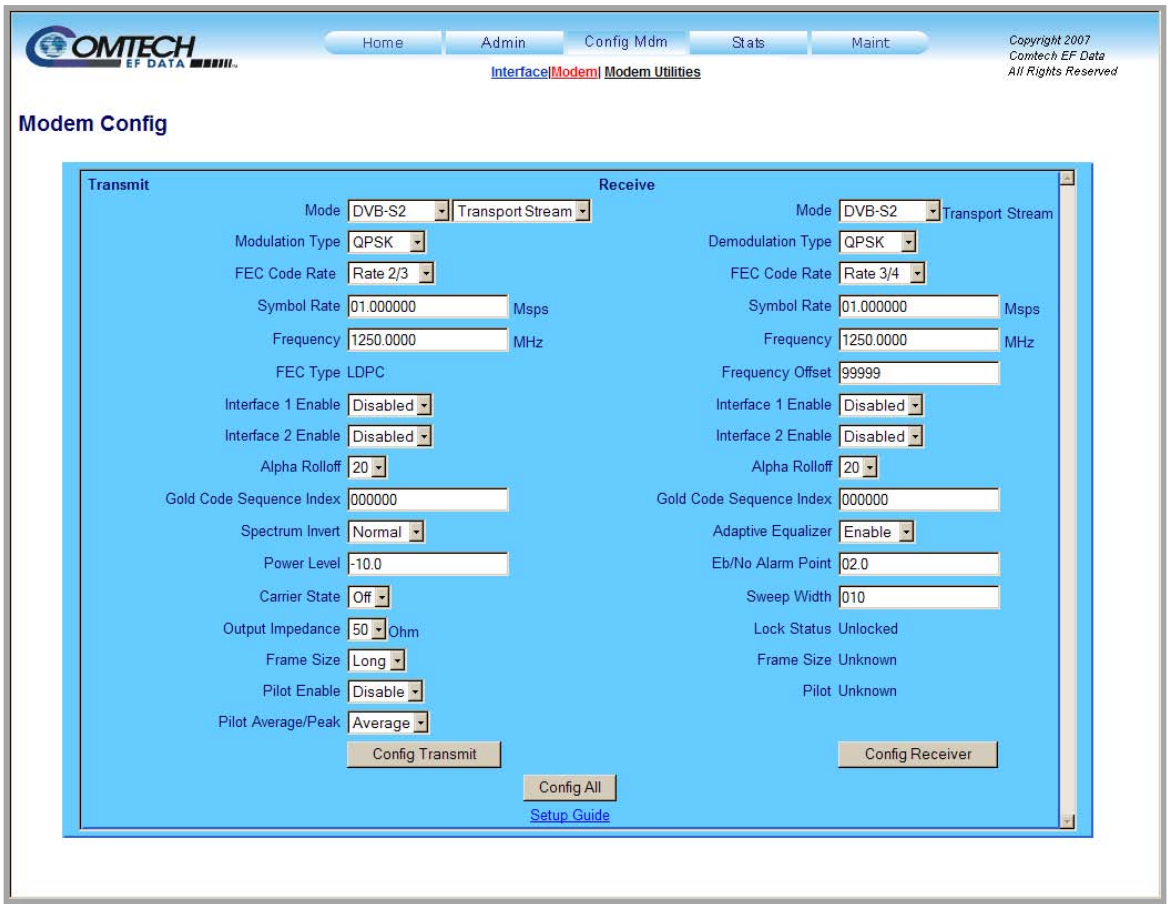


Figure 6-8. Config Mdm | Modem page

Use the '**Config | Modem'** page (**Figure 6-8**) to configure **Transmit** (Tx) and **Receive** (Rx) operating parameters.

IMPORTANT

The Tx / Rx Interface Types and Framing Modes have higher priority than other parameters, and should be configured before setting other parameters.

For details pertaining to the configuration parameters available on this page, refer to **Chapter 5. FRONT PANEL OPERATION**.

Once the desired configuration settings have been made on this page, click **[Config Transmit], [Config Receiver]**, or **[Config All]** to save these changes.

6.5.4.3.3 Config Mdm | Modem Utilities

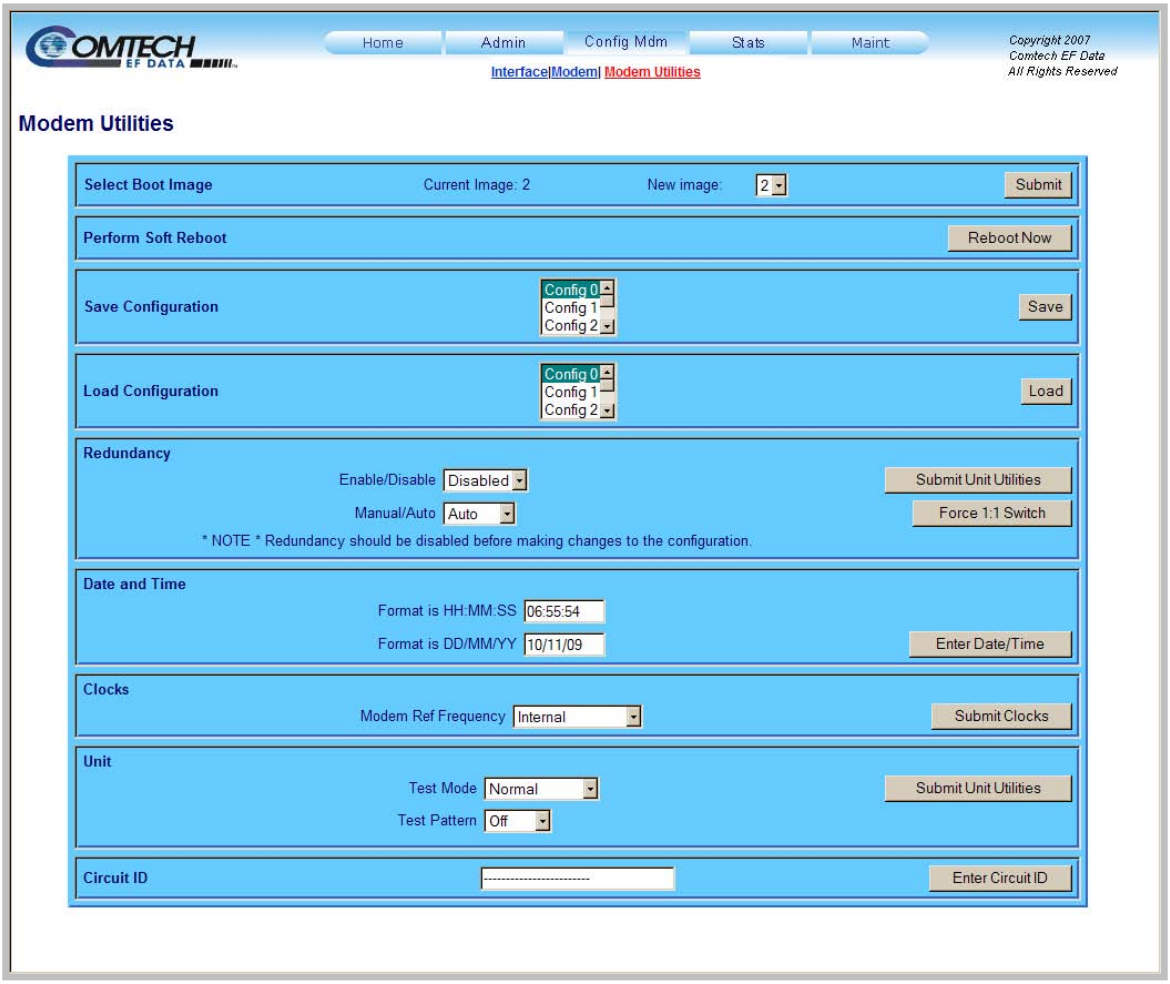


Figure 6-9. Config Mdm | Modem Utilities page

Use the '**Config Mdm | Modem Utilities**' page (**Figure 6-9**) to perform the following Modem Utilities tasks:

Select Boot Image

Use the dropdown menu to select the **New** (boot) **Image** as **1** or **2**; click **[Submit]** to save this setting.

Perform Soft Reboot

Click [**Reboot Now**] to restart the unit, using the most recently saved configurations/settings.

Saving and Loading Configurations;

Use the dropdown menus to manage operational configurations for **Config 0** through **Config 9**; click **[Save]** to store or **[Load]** to restore a configuration.

Redundancy

- Use the dropdown menus to **Enable** or **Disable** redundanc or set switching as **Manual** or **Auto**; click **[Submit Unit Utilities]** to save these new settings.
- Click [Force 1:1 Switch] to execute a forced switchover of operation.

Date and Time

Type in the time in **HH:MM:SS** format, or the date in **DD/MM/YY** format, then click **[Enter Date/Time]** to save these new settings.

Clocks

Use the dropdown menu to select the desired **Modem Ref Frequency**, then click **[Submit Clocks]** to save this setting.

Unit

Use the dropdown menus to select the desired **Test Mode** and **Test Pattern**, then click **[Submit Unit Utilities]** to save these new settings.

Circuit ID

Type in the desired text string, then click **[Enter Circuit ID]** to save this new parameter.

For details pertaining to the configuration parameters available on this page, refer to **Chapter 5. FRONT PANEL OPERATION**.

6.5.4.4 Stats (Statistics) Pages

The **Stats** pages provide the user with status, event logging, and operational statistics windows.

6.5.4.4.1 Stats | Modem Status

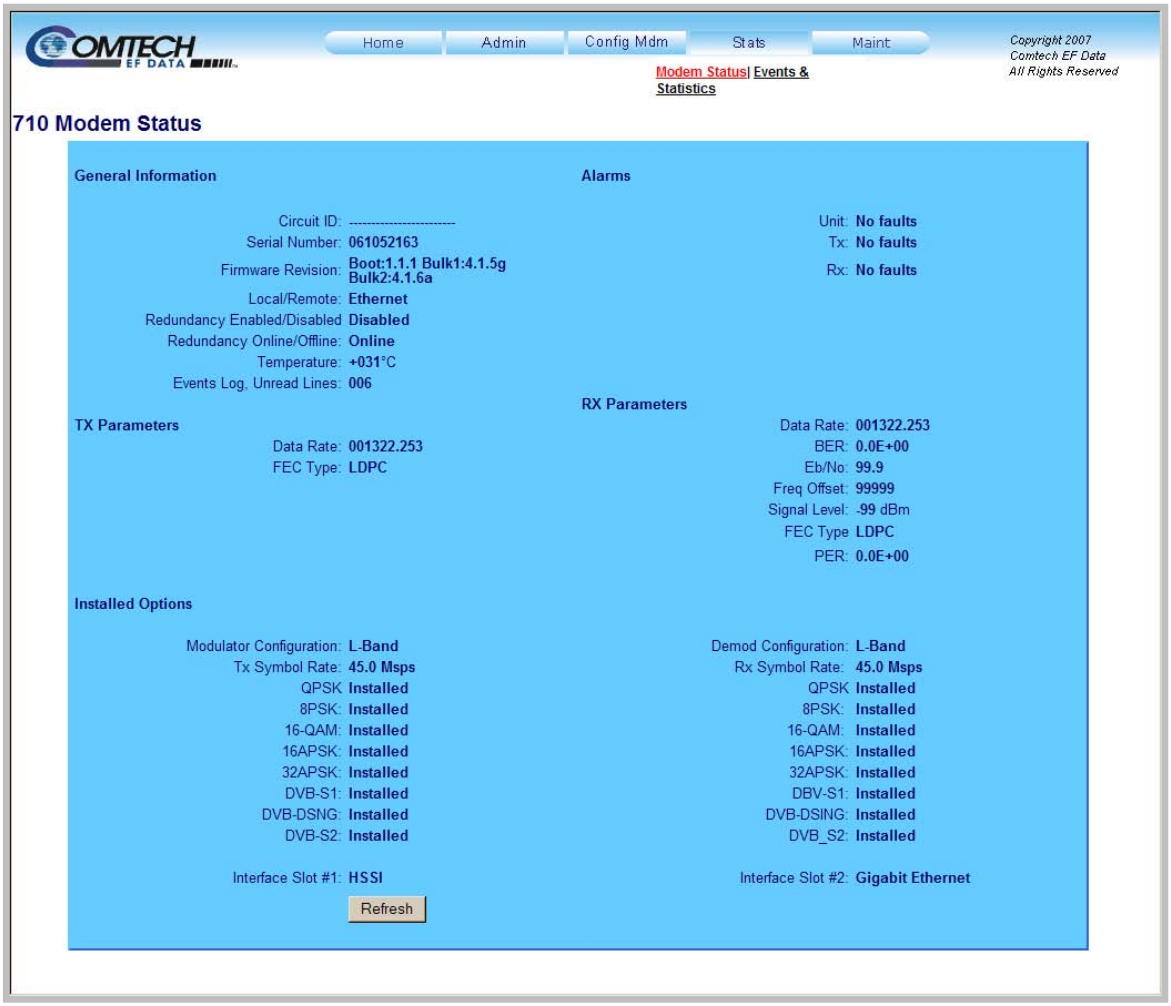


Figure 6-10. Stats | Modem Status page

The '**Stats | Modem Status'** page (**Figure 6-10)** provides a ***read-only*** status viewing/configuration information page pertaining to:

- **General modem operating and configuration information;**
- **Alarms;**
- **Tx and Rx Parameters;**
- **Tx and Rx Installed options (Data Interfaces, FAST, etc.).**

Click **[Refresh]** as needed to execute update of the information provided on this page.

6.5.4.4.2 Stats | Events & Statistics

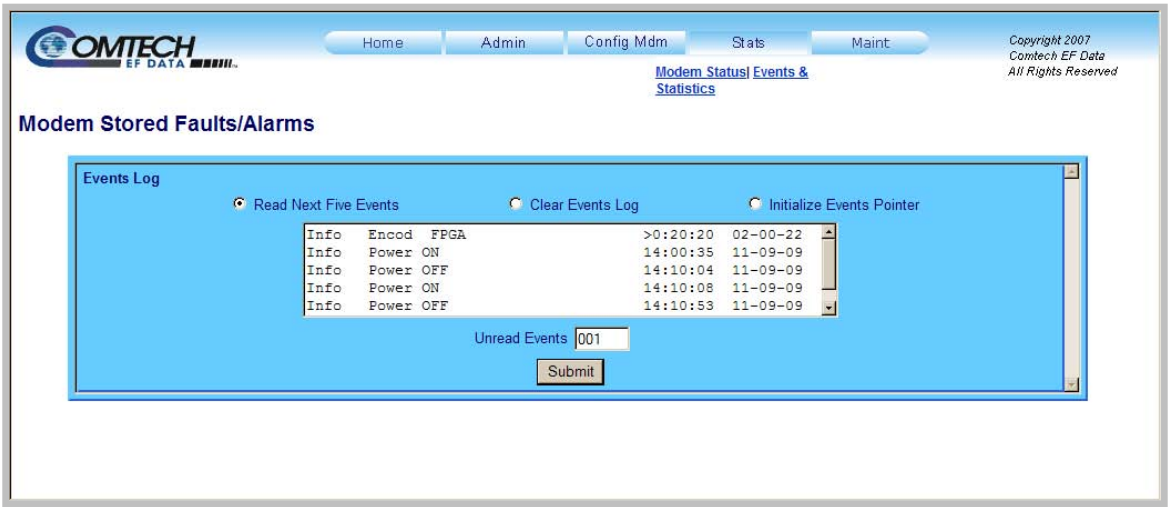


Figure 6-11. Stats | Events & Statistics page

Use the '**Stats | Events & Statistics'** page (**Figure 6-11)** to review a scrollable record of the modem's stored events. Note the following:

- **Read Next Five Events:** Select to buffer the next group of five stored events into the scrollable **Events** window.
- **Clear Events Log:** Select to wipe clean the stored events log.
- **Initialize Events Pointer:** Select to reset the log's internal pointer.
- **Unread Events:** Displays the total number of *unread* stored events in the **Events** window. As stored event groups are displayed, this number adjusts downward accordingly.

Once the desired settings have been entered, click **[Submit]** as needed to execute update of the scrollable window contents.

6.5.4.5 Maint | Unit Info Page

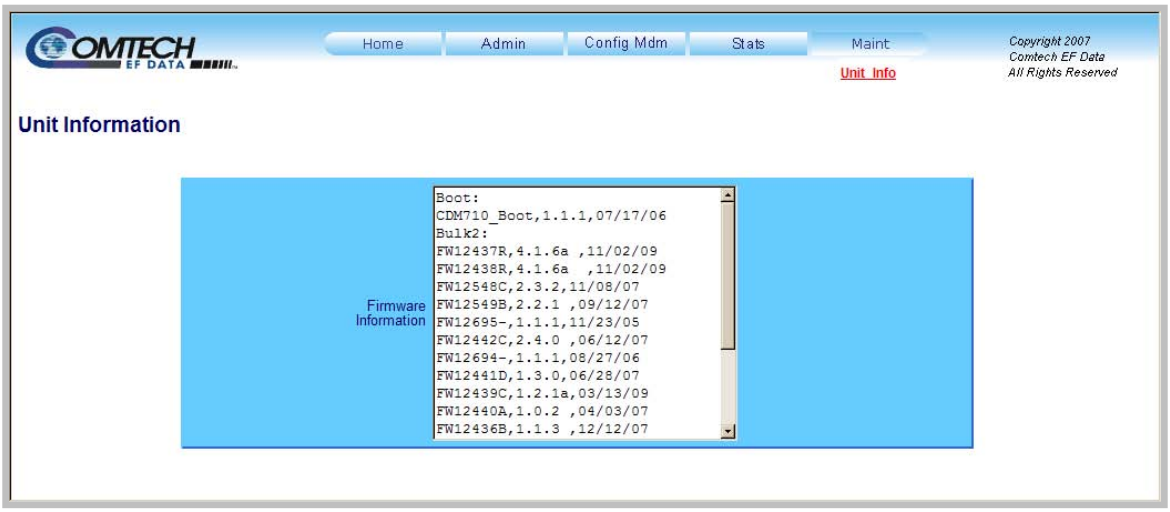


Figure 6-12. Maint | Unit Info page

Use the '**Maint | Unit Info**' page (**Figure 6-12**) to review a *read-only* scrollable status window that provides information about the currently loaded Bootrom; for Image 1 and Image 2, the user can scroll through information of all the constituent firmware blocks that make up the bulk.

Notes:

Chapter 7. FORWARD ERROR CORRECTION OPTIONS

7.1 Introduction

The CDM-710 Broadcast Satellite Modem operates with error correction base upon the DVB standards:

- **DVB-S –** QPSK with concatenated Viterbi and Reed Solomon.
- **DVB-DSNG –** 8-PSK and 16-QAM with concatenated Viterbi and Reed Solomon.
- **DVB-S2 –** QPSK, 8-PSK, 16-APSK and 32-APSK with concatenated Low Density Parity Code (LDPC) and Bose-Chaudhuri-Hocquenghem (BCH).

DVB-S and DVB-DSNG anchor one the most widely adopted modulation and coding schemes deployed today and are universally employed for satellite broadcast and related applications today. Now DVB-S2 has defined a new generation of performance that boosts throughput by about 30% over the same transponders using a new type coding that exceeds the capability of concatenated Viterbi and Reed Solomon coding.

7.2 Viterbi and Reed Solomon

The concatenated Viterbi and Reed Solomon coding technique produces significant improvement over Viterbi decoding alone. Simplistically, a Reed Solomon block decoder follows the convolutional Viterbi decoder to further enhance error correction. Errors exiting the Viterbi decoder tend to occur in clusters or errors bursts. The Reed Solomon decoder works well correcting burst errors so the combination delivers improved performance. To further improve the error correcting capability, an interleaver is placed between the two schemes to spread the errors so fewer occur in a given block.

7.3 LDPC and BCH

LDPC and BCH is also concatenated technique. LDPC is a very powerful coding scheme with significant, Near-Shannon Bound Performance. In some cases, as the carrier-to-noise ratio increases, the LDPC error correction starts flaring toward an error floor so BCH error correction follows LDPC and eliminates the flare for any practical range of error rates.

LDPC also functions differently than Viterbi decoding by using iterative decoding. In this process the data initially corrected by the LDPC decoder is re-encoded and run through the decoder again to correct additional errors. Key to this is the soft decision output from the LDPC decoder and a high-speed processor operating at a rate much higher than the data rate. The LDPC decoder runs the iterative process as many times as possible before corrected data is finally outputted to make way for a new block of data entering the decoder. LDPC also uses interleaving to spread the errors. In contrast, Viterbi error correction operates by passing data through the convolutional error correction process a single time.

The error correcting capability of LDPC is improved by using large block sizes. This also increases latency. However, in one-way broadcast applications this is not a drawback. Links with LDPC normally operate at multi-megabit data rates where latency effects are reduced. The standard block size for LDPC is 64,800 bits, and for lower data rate applications there is a short frame block at 16,800 bits that suffers only a small error correcting loss (0.2 to 0.3 dB) compared to the standard block.

7.3.1 Range of Data Rates

For the range of Data Rates, refer to **Sect. 1.5 SUMMARY OF SPECIFICATIONS**.

7.3.2 Eb/No, Es/No Spectral Efficiency, and Occupied Bandwidth

Depending upon the operating mode DVB standard uses different modes of specifying performance with a modem in IF Loop and Additive White Gaussian Noise (AWGN):

- **DVB-S (QPSK with Viterbi and Reed Solomon):** BER = $2x10^{-4}$ after Viterbi (before Reed Solomon) and QEF after Reed Solomon at the specified Eb/No and includes a modem implementation loss of 0.8 dB and the noise bandwidth increase due to the outer code (10 log 188/204 = 0.36 dB).

  Quasi-Error-Free (**QEF**) corresponds to less than one uncorrected error event per hour, or BER = 10^{-10} to 10^{-11} at the input of an MPEG-2 demultiplexer. This is the error rate most commonly used.

- **DVB-DSNG (8-PSK and 16-QAM with Viterbi and Reed Solomon):** Similar to DVB-S. The modem implementation ranges from 1.0 dB (8-PSK 2/3) to 2.1 dB (16-QAM 7/8).

- **DVB-S2 (QPSK, 8-PSK, 16-APSK and 32-APSK with LDPC and BCH):** PER (packet error rate) = 10-7 after LDPC and BCH at the specified Es/No. This is a theoretical value with perfect carrier recovery and symbol synchronization, and no modem oscillator phase noise. The manufacturer decides the implementation margin and specifies performance.

  The other difference is the use of PER (packet error rate) based upon a 188 or 204 byte MPEG frame size instead of BER (bit error rate).

  Also, note the use of Es/No instead of Eb/No. When links operate at constant symbol rate, this is a good method for comparing the performance of different modulation types and code rates.

  The relation between the two quantities is given by:

  $$Eb/No = Es/No - 10xLog(Spectral\ Efficiency)$$

Another useful parameter is the occupied bandwidth is the bandwidth between -10 dB points of the power spectral density, which are approximately:

Occupied Bandwidth = 1.19 x Symbol Rate, for 35% Rolloff

= 1.15 x Symbol Rate, for 25% Rolloff

= 1.12 x Symbol Rate, for 20% Rolloff

Table 7-1 provides the Eb/No, spectral efficiency and occupied bandwidth for the CDM-710.

Table 7-2 and **Table 7-3** outline these parameters per the modem's DVB schemes.

Figure 7-1 through **Figure 7-7** illustrate the error performance characteristics. To convert Es/No to Eb/No:

Eb/No = Es/No - 10xLog(Spectral Efficiency)

Table 7-1. Eb/No, Spectral Efficiency and Occupied Bandwidth*

Mode	Type	FEC Code	Inner Code Rate	Eb/No at QEF	Spectral Efficiency (bps/Hz)	Normalized Symbol Rate (= Bit Rate x)	Occupied * Bandwidth for 10 Mbps (35% Rolloff)
DVB-S	QPSK	Conv+RS	1/2	4.5	0.921569	1.085	12.913
	QPSK	Conv+RS	2/3	5.0	1.228758	0.814	9.685
	QPSK	Conv+RS	3/4	5.5	1.382353	0.723	8.609
	QPSK	Conv+RS	5/6	6.0	1.535948	0.651	7.748
	QPSK	Conv+RS	7/8	6.4	1.612745	0.620	7.379
DVB-DSNG	8-PSK	Conv+RS	2/3	6.9	1.843137	0.543	6.456
	8-PSK	Conv+RS	5/6	8.9	2.303922	0.434	5.165
	8-PSK	Conv+RS	8/9	9.4	2.457516	0.407	4.842
	16-QAM	Conv+RS	3/4	9.0	2.764706	0.362	4.304
	16-QAM	Conv+RS	7/8	10.7	3.225490	0.310	3.689

* Taken at the -10 dB points on the plot of power spectral density, the occupied bandwidth is 1.19 x Symbol Rate for 35%, and 1.15 x Symbol Rate for 25%.

Table 7-2. DVB-S2 Standard FECFrame = 64, 800 bits

(QPSK 1/4, 1/3 and 2/5 are for information purposes)

Type	Inner FEC Code	**Es/No at PER = 10^{-7}	Spectral Efficiency (bps/Hz)	Normalized Symbol Rate (= Bit Rate x)	* Occupied BW for 10 Mbps (25% Rolloff)	Spectral Efficiency (bps/Hz)	Normalized Symbol Rate (= Bit Rate x)	* Occupied BW for 10 Mbps (25% Rolloff)
			Pilots Off			Pilots On		
QPSK	1/4	-1.85	0.490243	2.040	23.458	0.478577	2.090	24.030
	1/3	-0.74	0.656448	1.523	17.519	0.640827	1.560	17.946
	2/5	0.20	0.789412	1.267	14.568	0.770627	1.298	14.923
	1/2	1.50	0.988858	1.011	11.630	0.965327	1.036	11.913
	3/5	2.73	1.188304	0.842	9.678	1.160026	0.862	9.914
	2/3	3.60	1.322253	0.756	8.697	1.290788	0.775	8.909
	3/4	4.53	1.487473	0.672	7.731	1.452076	0.689	7.920
	4/5	5.18	1.587196	0.630	7.245	1.549426	0.645	7.422
	5/6	5.68	1.654663	0.604	6.950	1.615288	0.619	7.119
	8/9	6.70	1.766451	0.566	6.510	1.724416	0.580	6.669
	9/10	6.92	1.788612	0.559	6.430	1.746049	0.573	6.586
8PSK	3/5	6.20	1.779991	0.562	6.461	1.739569	0.575	6.611
	2/3	7.32	1.980636	0.505	5.806	1.935658	0.517	5.941
	3/4	8.61	2.228124	0.449	5.161	2.177525	0.459	5.281
	5/6	10.15	2.478562	0.403	4.640	2.422276	0.413	4.748
	8/9	11.49	2.646012	0.378	4.346	2.585924	0.387	4.447
	9/10	11.78	2.679207	0.373	4.292	2.618365	0.382	4.392
16APSK	2/3	9.97	2.637201	0.379	4.361	2.574613	0.388	4.467
	3/4	11.21	2.966728	0.337	3.876	2.896320	0.345	3.971
	4/5	12.03	3.165623	0.316	3.633	3.090495	0.324	3.721
	5/6	12.61	3.300184	0.303	3.485	3.221863	0.310	3.569
	8/9	13.89	3.523143	0.284	3.264	3.439530	0.291	3.343
	9/10	14.13	3.567342	0.280	3.224	3.482680	0.287	3.302
32APSK	3/4	13.73	3.703295	0.270	3.105	3.623332	0.276	3.174
	4/5	14.64	3.951571	0.253	2.910	3.866247	0.259	2.974
	5/6	15.28	4.119540	0.243	2.792	4.030589	0.248	2.853
	8/9	16.69	4.397854	0.227	2.615	4.302894	0.232	2.673
	9/10	17.05	4.453027	0.225	2.583	4.356875	0.230	2.640

* Taken at the -10 dB points on the plot of power spectral density, the occupied bandwidth is 1.19 x Symbol Rate for 35%, and 1.15 x Symbol Rate for 25%.

** Includes implementation loss.

Table 7-3. DVB-S2 Short FECFrame = 16,200 bits*

(QPSK 1/4, 1/3 and 2/5 are for information purposes)

Type	Inner FEC Code	***Es/No at PER = 10^{-7}	Spectral Efficiency (bps/Hz)	Normalized Symbol Rate (= Bit Rate x)	** Occupied BW for 10 Mbps (25% Rolloff)	Spectral Efficiency (bps/Hz)	Normalized Symbol Rate (= Bit Rate x)	** Occupied BW for 10 Mbps (25% Rolloff)
			Pilots Off			Pilots On		
QPSK	1/4	-1.55	0.365324	2.737	31.479	0.357467	2.797	32.171
	1/3	-0.44	0.629060	1.590	18.281	0.615532	1.625	18.683
	2/5	0.50	0.760928	1.314	15.113	0.744564	1.343	15.445
	1/2	1.80	0.848840	1.178	13.548	0.830585	1.204	13.846
	3/5	3.03	1.156532	0.865	9.944	1.131661	0.884	10.162
	2/3	3.90	1.288400	0.776	8.926	1.260693	0.793	9.122
	3/4	4.83	1.420269	0.704	8.097	1.389725	0.720	8.275
	4/5	5.48	1.508181	0.663	7.625	1.475747	0.678	7.793
	5/6	5.98	1.596093	0.627	7.205	1.561768	0.640	7.363
	8/9	7.00	1.727961	0.579	6.655	1.690800	0.591	6.802
	9/10	7.22	NA	NA	NA	NA	NA	NA
8PSK	3/5	6.50	1.725319	0.580	6.665	1.692033	0.591	6.797
	2/3	7.62	1.922040	0.520	5.983	1.884959	0.531	6.101
	3/4	8.91	2.118761	0.472	5.428	2.077885	0.481	5.534
	5/6	10.45	2.381056	0.420	4.830	2.335120	0.428	4.925
	8/9	11.79	2.577778	0.388	4.461	2.528046	0.396	4.549
	9/10	12.08	NA	NA	NA	NA	NA	NA
16APSK	2/3	10.27	2.548792	0.392	4.512	2.505223	0.399	4.590
	3/4	11.51	2.809662	0.356	4.093	2.761633	0.362	4.164
	4/5	12.33	2.983575	0.335	3.854	2.932574	0.341	3.921
	5/6	12.91	3.157488	0.317	3.642	3.103514	0.322	3.705
	8/9	14.19	3.418357	0.293	3.364	3.359924	0.298	3.423
	9/10	14.43	NA	NA	NA	NA	NA	NA
32APSK	3/4	14.03	3.493093	0.286	3.292	3.419165	0.292	3.363
	4/5	14.94	3.709309	0.270	3.100	3.630805	0.275	3.167
	5/6	15.58	3.925526	0.255	2.930	3.842446	NA	NA
	8/9	16.99	4.249850	0.235	2.706	4.159906	0.240	2.764
	9/10	17.35	NA	NA	NA	NA	NA	NA

* Es/No for short FECFrame is about 0.3 dB higher than the standard. Values in the table are approximate.

** Taken at the -10 dB points on the plot of power spectral density, the occupied bandwidth is 1.19 x Symbol Rate for 35% and 1.15 x Symbol Rate for 25%

*** Includes implementation loss

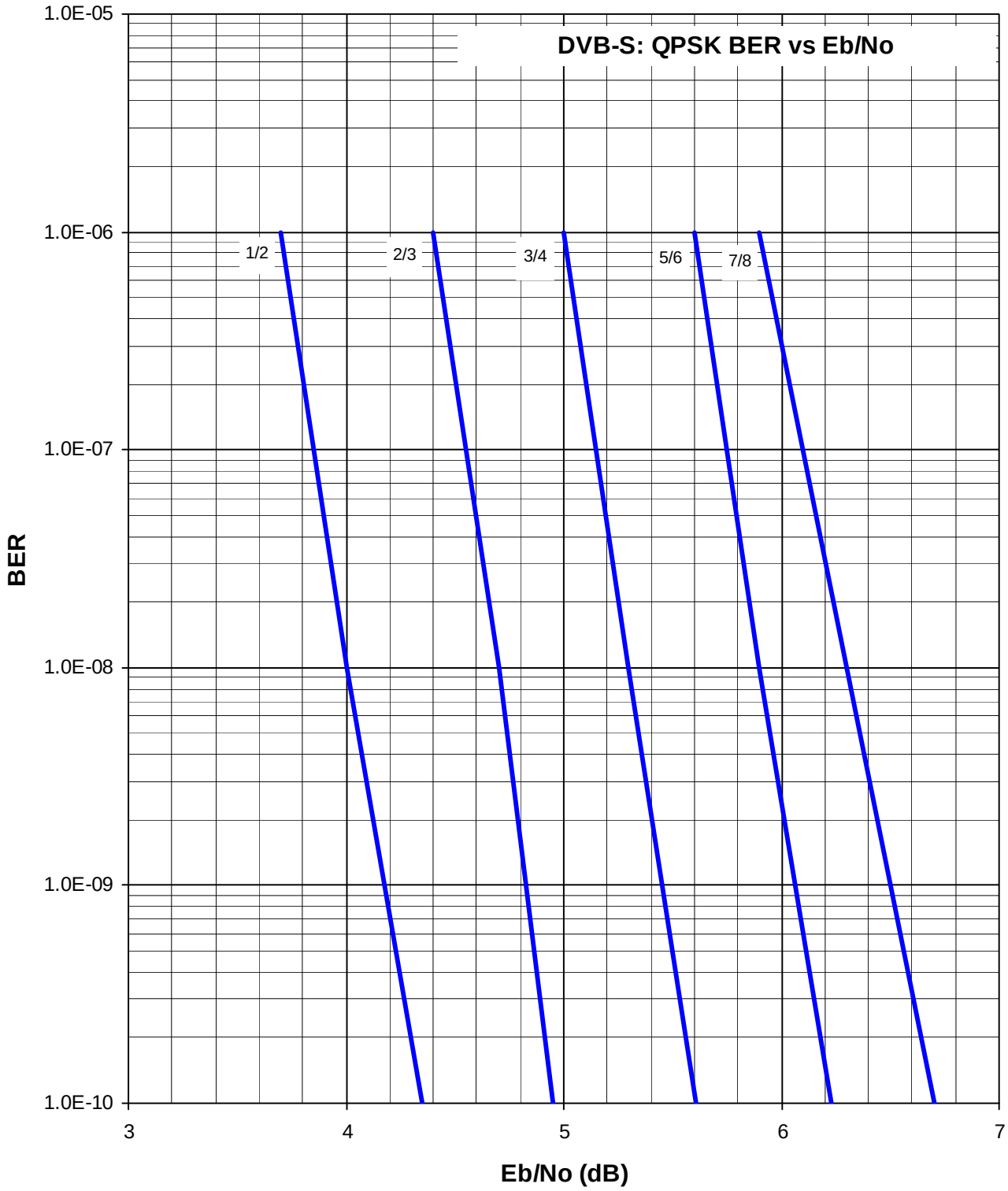


Figure 7-1. DVB-S QPSK BER versus Eb/No

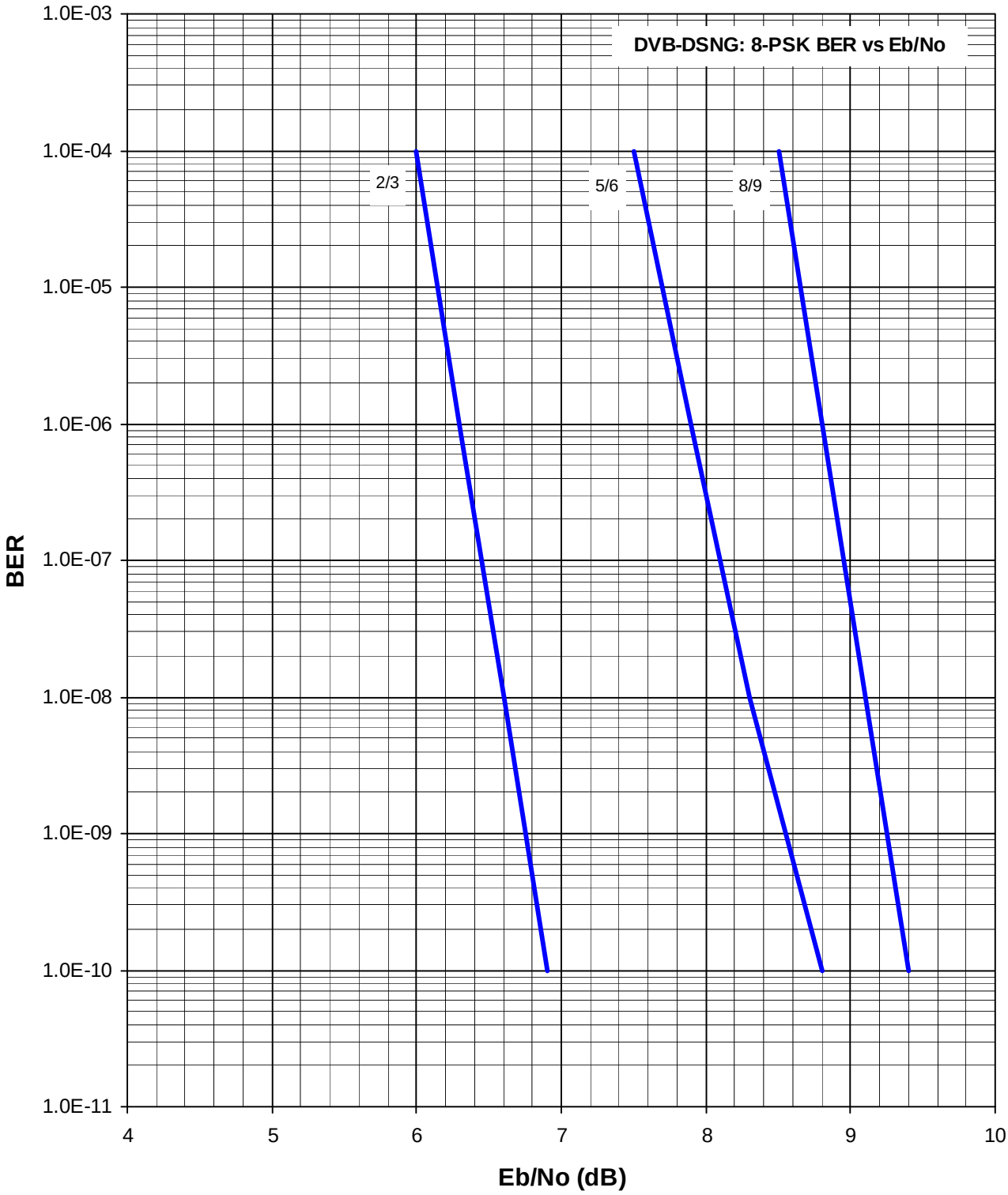


Figure 7-2. DVB-DSNG 8-PSK BER versus Eb/No

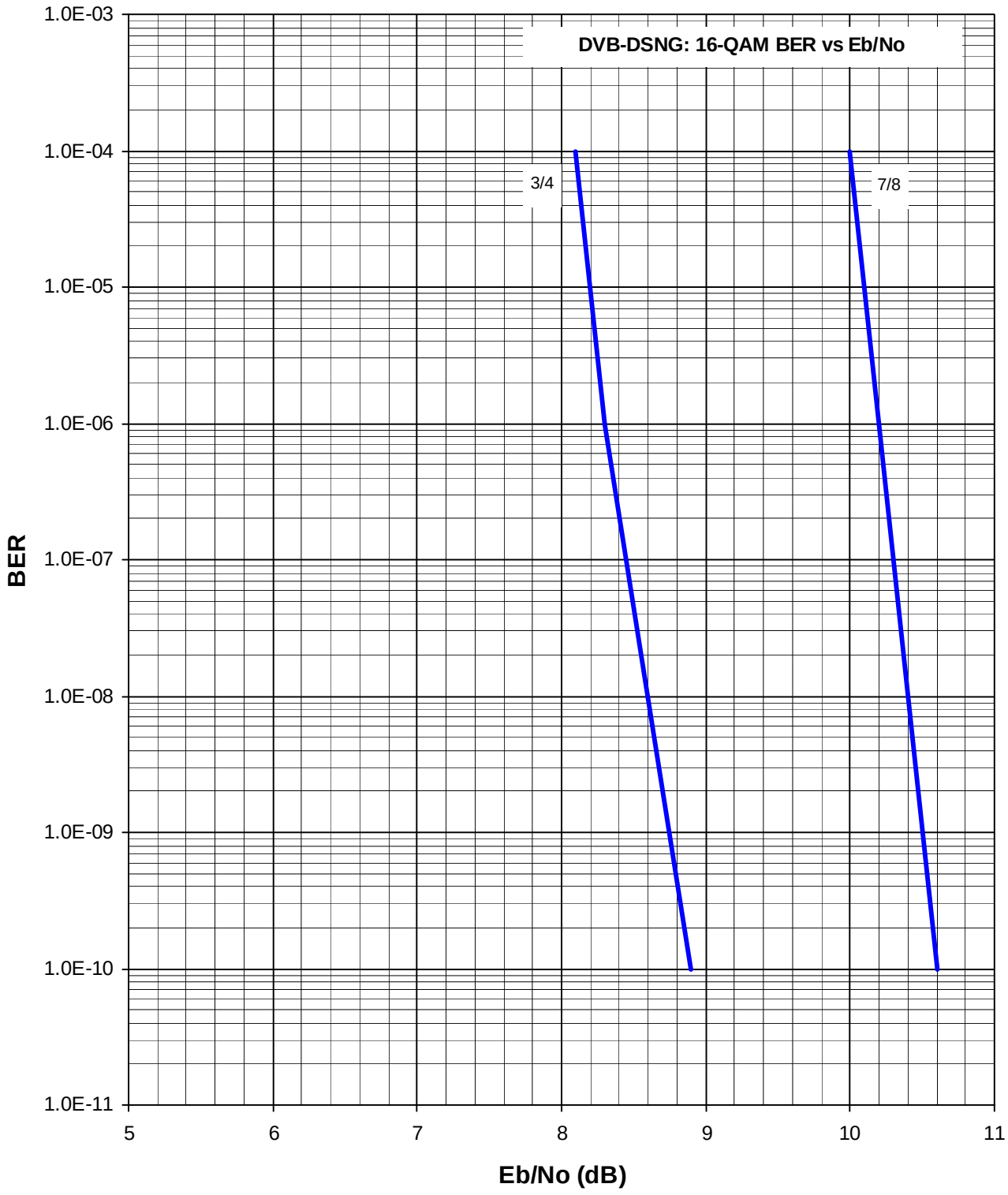


Figure 7-3. DVB-DSNG 16-QAM

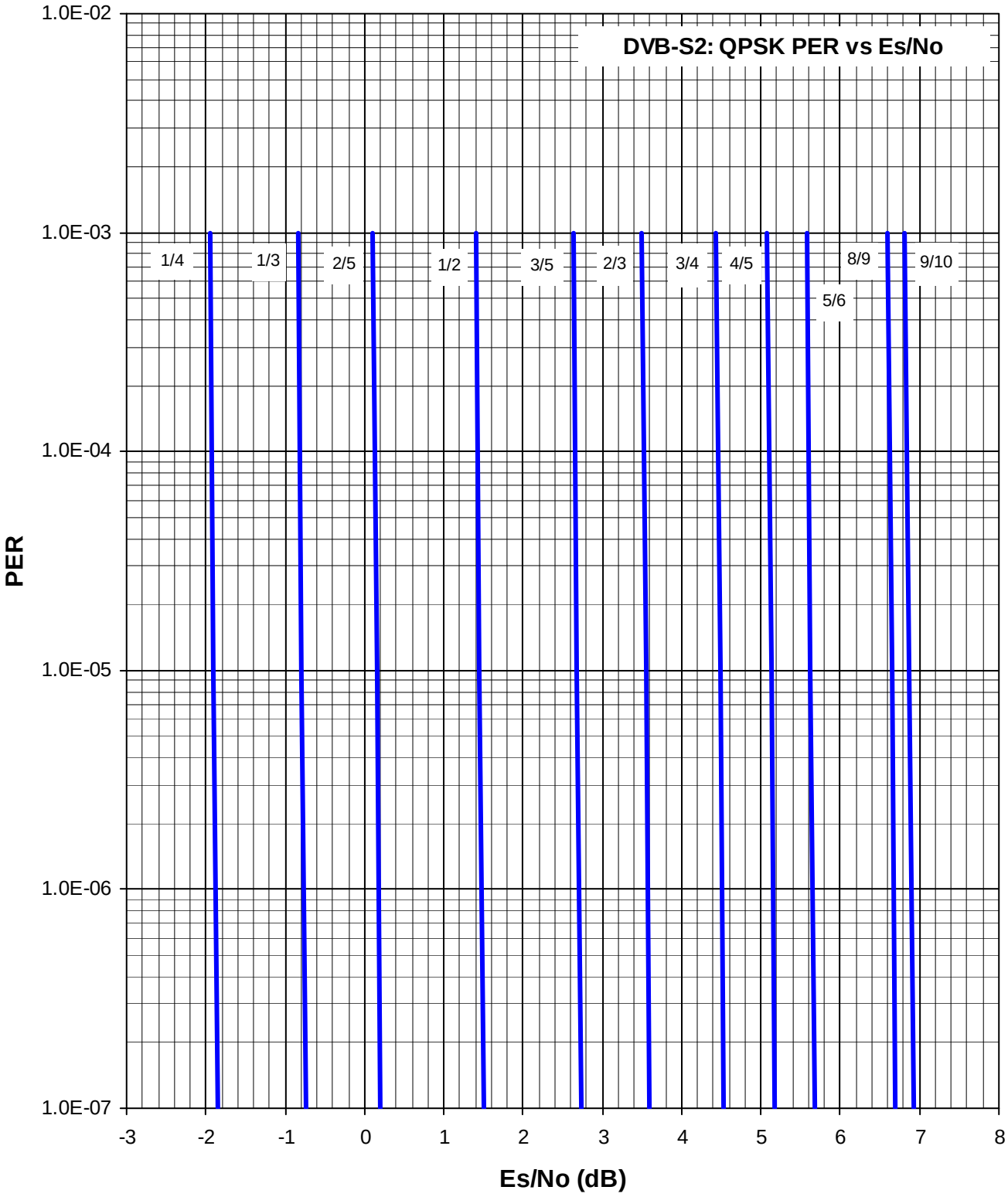


Figure 7-4. DVB-S2 QPSK Packet Error Rate versus Es/No
(QPSK 1/4, 1/3, and 2/5, Information Only)

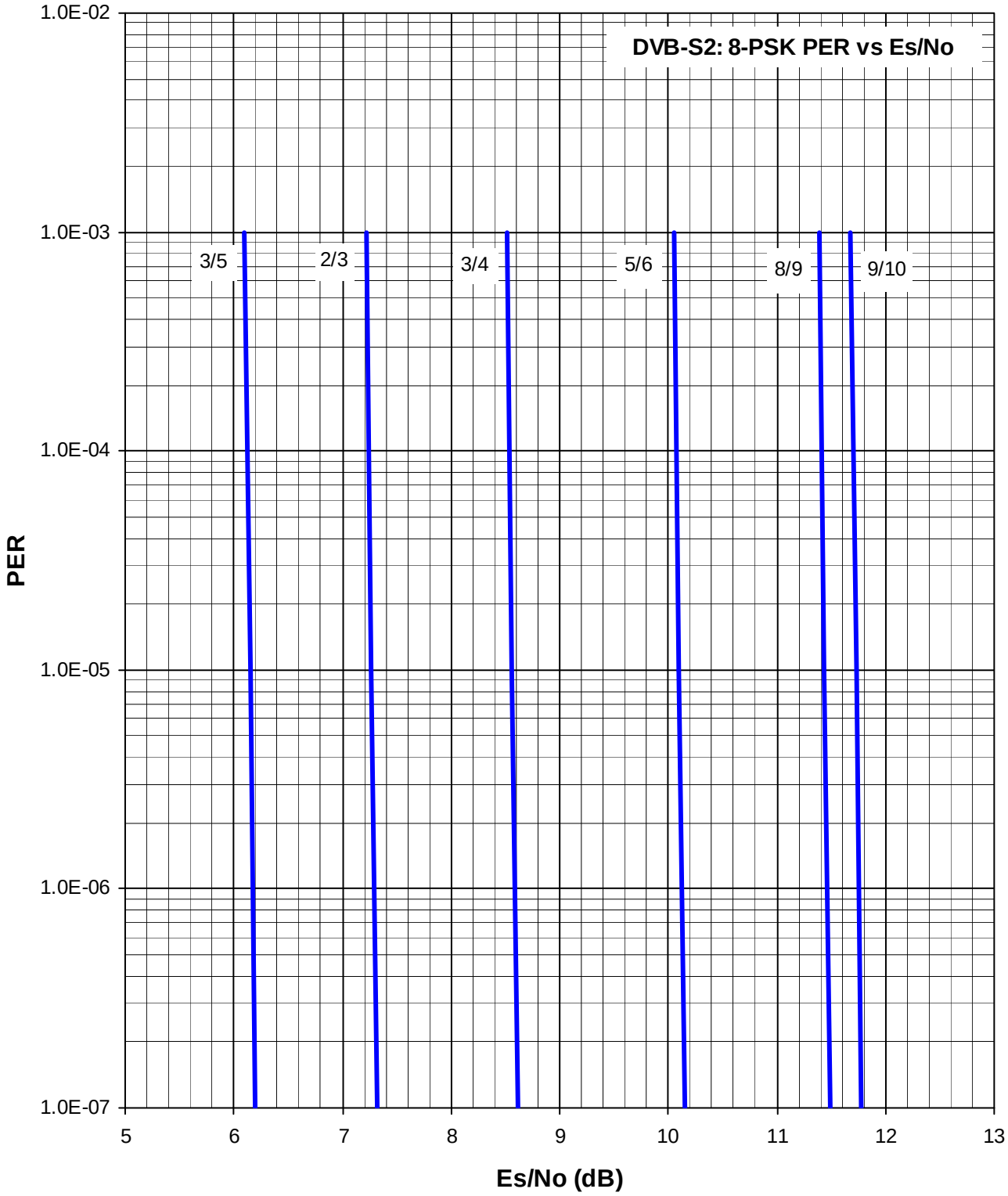


Figure 7-5. DVB-S2 8-PSK Packet Error Rate versus Es/No

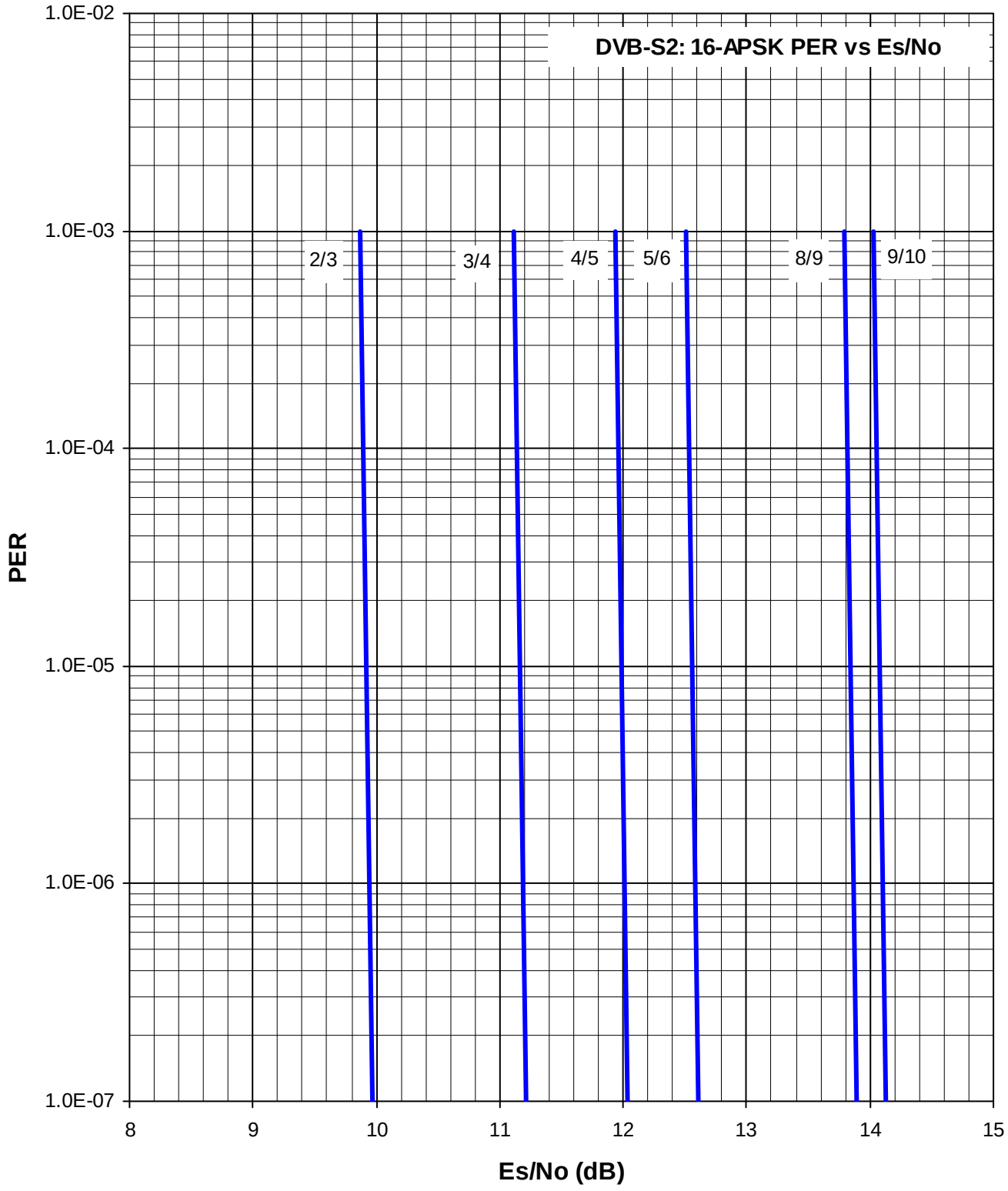


Figure 7-6. DVB-S2 16-APSK Packet Error Rate versus Es/No

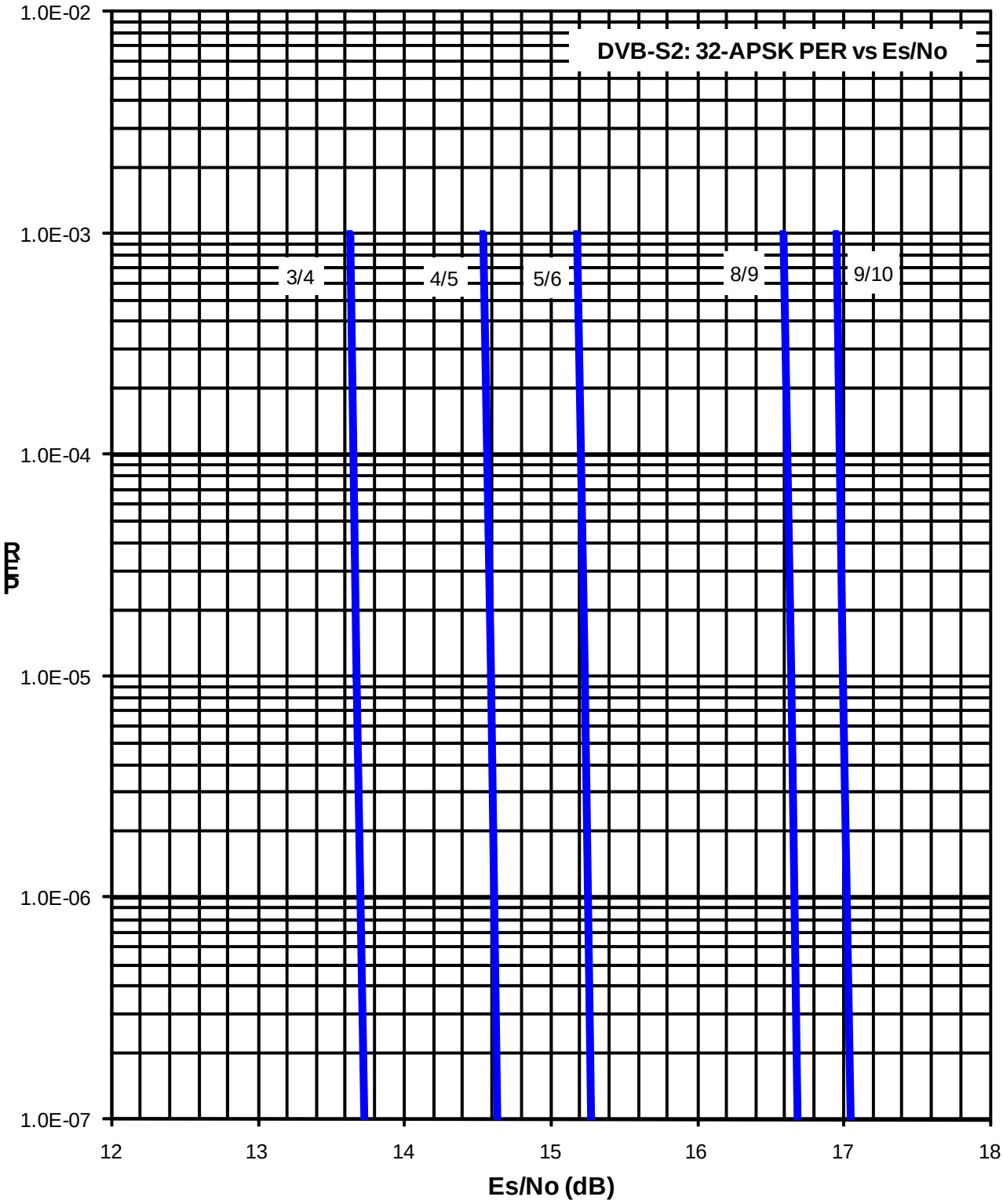


Figure 7-7. DVB-S2 32-APSK Packet Error Rate versus Es/No

Chapter 8. CDI-40 ASI INTERFACE MODULE

8.1 Introduction

The CDI-40 ASI Interface is a plug-in data module that inserts into the rear of the CDM-710 Broadcast Satellite Modem chassis. It provides physical and electrical connection between the external terrestrial device and the internal circuitry of the modulator or demodulator.

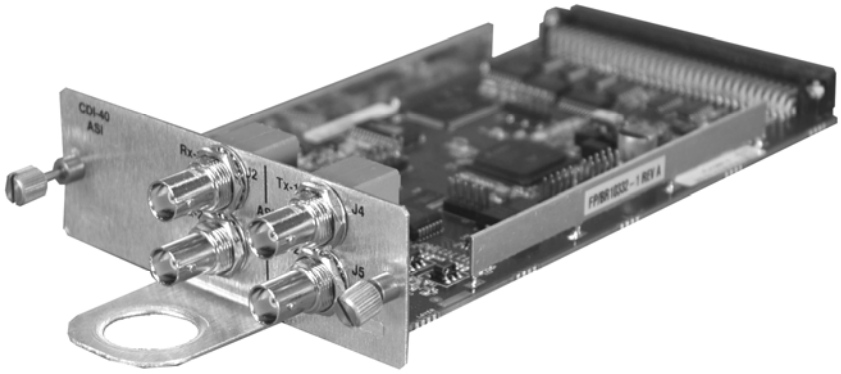
By convention, a modem is **D**ata **C**ommunications **E**quipment (DCE) where transmit data enters the data interface and receive data exits it. The ASI plug-in interface has full duplex capability. In addition, the module is automatically configured for simplex-transmit or simplex-receive operation when the module is plugged into a simplex chassis configured for modulator only or demodulator only operation.

Slot 1 of the CDM-710 – located at the center right of the chassis rear panel – is intended for the dedicated placement of a CDI-40 ASI or CDI-60 HSSI Interface module. Slot 2 – located at the right side end of the chassis rear panel – is assigned a blank panel or is restricted to the dedicated placement of a CDI-70 10/100/1000 Base-T Gigabit Ethernet (GigE) Interface module, depending upon configurations allowed at time of order.

8.2 Physical Description

The CDI-40 combines two electrical and physical interfaces into a single assembly. The ASI section provides DVB compliant interface with BNC connectors. As shown in **Figure 8-1**, there are two versions of the CDI-40 ASI Interface module; block diagrams for both versions are provided in **Figure 8-2**. Note the following:

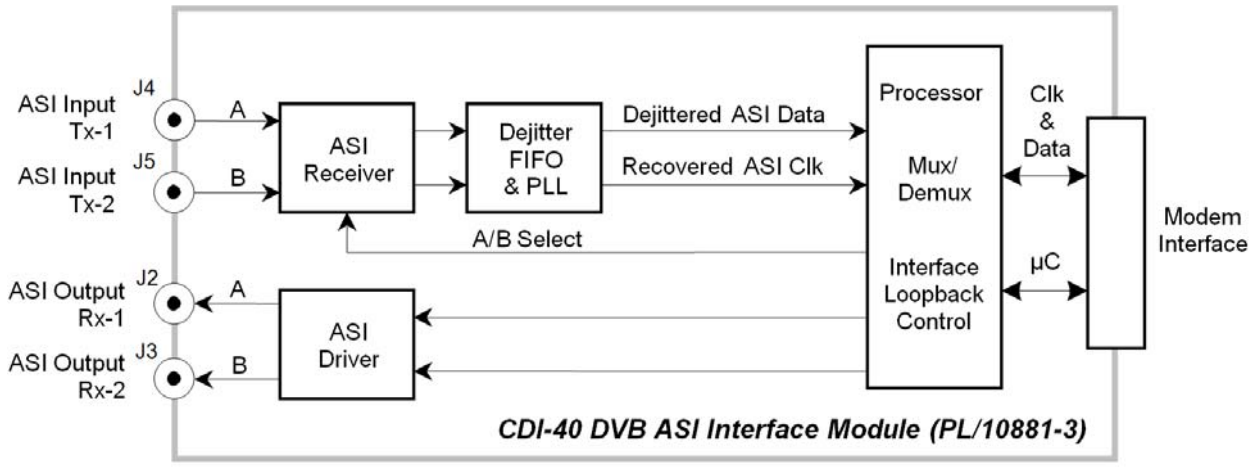
ASI Interface Usage By Application	
PL/10881-3	Standard non-redundant applications: • Tx only 1:1 redundancy. Rx output (J2 and J3) is the standard ASI level • Full duplex 1:N redundancy. Rx output (J2 and J3) is the standard ASI level
PL/10881-4	Standard non-redundant applications (excluding J3): • Tx only, Rx only or full duplex (Tx and Rx) 1:1 redundancy (see Figure 8-3). o Rx output J2 is standard ASI level o Rx output J3 is higher so the standard level is delivered after a 3 dB combiner (see Figure 8-3). • Full duplex 1:N redundancy (excluding J3).



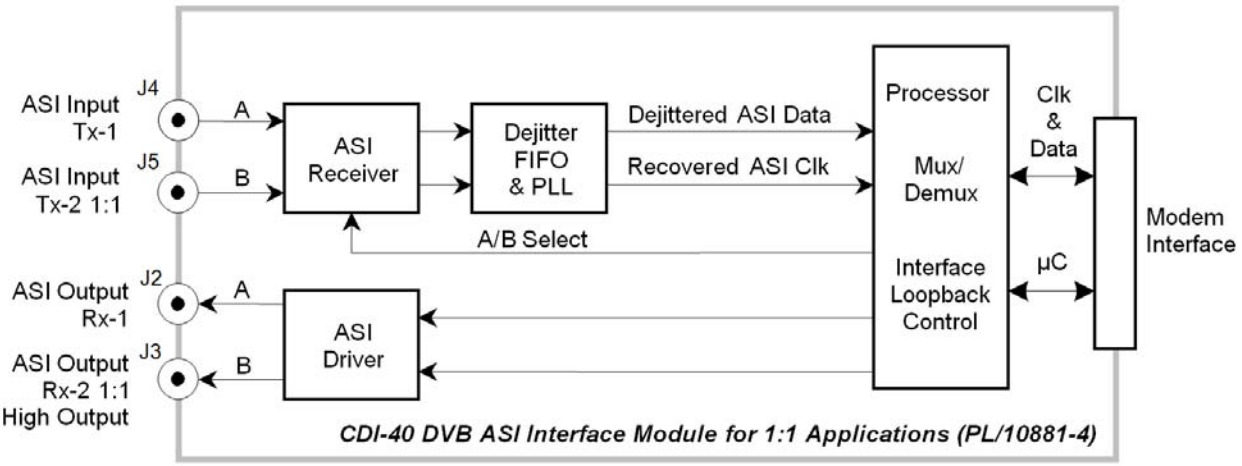
PL/10881-3 – CDI-40 ASI Interface for <u>non</u>-1:1 Applications or Tx Only 1:1

PL/10881-4 – CDI-40 ASI Interface for 1:1 Applications

Figure 8-1. CDI-40 ASI Interface Module



PL/10881-3 – CDI-40 ASI Interface for non-1:1 Applications or Tx Only 1:1



PL/10881-4 – CDI-40 ASI Interface for 1:1 Applications

Figure 8-2. CDI-40 ASI Interface Module Block Diagrams

8.2.1 Connector Pinouts

The CDI-40 ASI Interface connector pinouts are as follows:

PL/10881-3 CDI-40 ASI Interface for non-1:1 Applications or Tx Only 1:1		
Connector	**Description**	**Signal Direction**
J2, J3	Rx Data, BNC Female	Output
J4, J5	Tx Data, BNC female	Input

PL/10881-4 CDI-40 ASI Interface for 1:1 Applications		
Connector	**Description**	**Signal Direction**
J2,	Rx Data, BNC Female	Output
J3	Rx Data, BNC Female, 1:1 Redundant (High-Level)	Output
J4, J5	Tx Data, BNC female	Input

8.3 Functional Description

Operation for either ASI is selected by programming the module for operation, either from the CDM-710 front panel keypad/display or from the remote communications ports. Refer to **Chapter 5. FRONT PANEL OPERATION** or **Appendix C. REMOTE CONTROL** for further information.

8.3.1 Input/Output Data Formats

The CDI-40 operates at a 270 Mbps transport rate for all data rates. The required encoding of this transport is defined in EN 80053-9 and the Cypress Hotlink IC data sheets. See applicable specifications section.

The information that follows applies to baseband data and not the data transformed to the 270 Mbps physical transport layer.

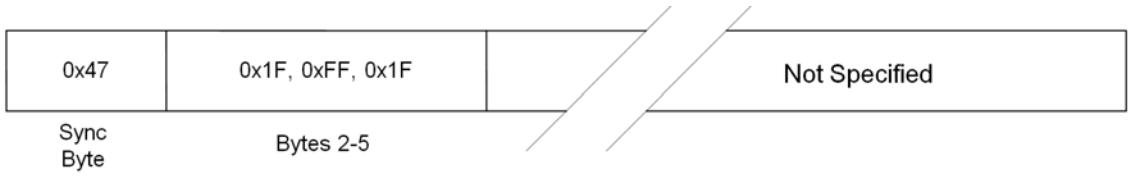
There are two general modes of operation (note that the Tx interface correlates from sync word or sync signal):

ASI Sync Mode	Description
188 Mode	The unit looks for a DVB/MPEG-2 frame consisting of 1 sync byte (0x47) and 187 bytes of data. The frame structure is acquired by the interface to create a satellite frame of 204 bytes by adding 16 bytes of Reed-Solomon check bytes. The demodulator removes the 16 check bytes and the 188-byte frame is returned to the terrestrial circuit.
204 Mode	The unit expects a DVB/MPEG-2 frame consisting of 1 sync byte (0x47), 187 bytes of data and 16 bytes of filler.

For ASI operation, data is either constant packet arrival or constant burst arrival at the equivalent serial data rate. The standard frame formats / MPEG-2 I/O data formats are as follows:

Data Format	Description
Data	Payload data is byte serial with MSB first.
	For 188 Mode, the payload is 187 bytes in length, preceded by a sync word.
Transport Rate (ASI)	270 Mbps for all data rates.

8.3.1.1 MPEG-2 Null Packet



When the data input to the CDI-40 is disconnected or not synchronized the modulator sends MPEG-2 null packets in accordance with ISO/IEC DIS 13818-1, Coding Of Moving Pictures And Associated Audio.

If the interface is in Test mode with the patterns turned ON, the modulator sends pseudo random pattern over the link in the 187 bytes following the sync byte whether Tx data into the modem is present or not.

8.3.2 ASI Interface Defaults

Default settings for the interface are as follows:

CDI-40 Interface Defaults	
Parameter	Default Setting
Mode	1, ASI active
Active Tx Input	J4
Data or Clock	Normal
ASI Frame Format	188
Loss of Data	Alarm
Loop Bandwidth	Wide

8.3.3 1:1 Applications

Figure 8-3 depicts the typical operation of the CDM-710 with ASI in 1:1 Redundancy (using the PL/10881-4 CDI-40 ASI Interface). This diagram applies to CDM-710 1:1 operations via the CRS-180 70/140 MHZ 1:1 Redundancy Switch (for use with the CDM-710) or the CRS-170A L-Band 1:1 Redundancy switch (for use with the CDM-710L). For more information about 1:1 Redundant operations with either of these switches, refer to the respective ***Installation and Operation Manual***.

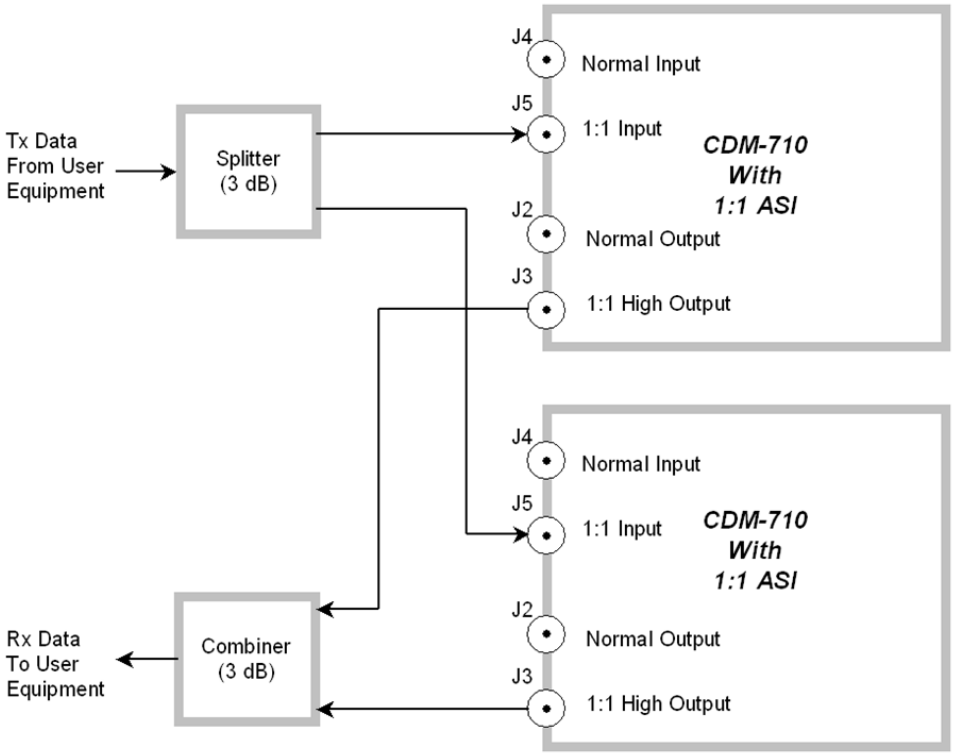


Figure 8-3. Typical PL/10881-4 CDI-40 ASI Interface 1:1 Application

8.4 General Specifications

General Specifications	
Data Framing Formats	ASI: 188 or 204 byte packets per ETS 300 421.
Test Pattern	Tx only, 2047 or 2^{23}-1 pattern compatible with typical BER tester
Hot Pluggable	No
ASI Specifications	
Data Rate	Up to155 Mbps
Tx Clock Rate Acquisition	Programmed data rate ± 100 ppm
ASI Transport	The transport rate is 270 Mbps for all data rates
Impedance	75Ω
Return Loss	13 dB over 5 to 270 MHz
Connectors	BNC Female
Electrical Properties	Per EN 500083-9
Packet Types	Burst or distributed
Signal Types	Serial data
Voltage Level Rx Out	800 mV ± 10% into 75Ω, (J2, J3 of PL/10881-3 *or* J2 of PL/10881-4). J3 of PL/10881-4 is higher for 1:1 applications for 800 mV typical after 3 dB combiner (Figure 8-3).
ASI Data Loop 3 dB Frequency, Tx Only	• Wide – 2 Hz • Narrow – 0.5 Hz
Jitter Tolerance	Meets ITU-T G.823 (3/93) and ITU-T G.824 (3/93)
Jitter Transfer	≤ 0.5 dB peaking up to cutoff frequency; -20 dB per decade beyond cutoff.
Cable Length, Typical	• 30 meters (100 feet), RG59 • 40 meters (140 feet), Belden 8281
Tx Input Selection	Two inputs, with selection to control which is active
Loss Of Tx Input Data	Null packets are formed and transmitted. Loss of Tx Input is selectable as a fault or alarm.
Monitor & Control	
Controlled Functions	• Interface I/O Loopback, Digital Loopback • Data Rate • Loss of Data, Mask as Fault or Alarm • Variable ASI Mode
Monitored Functions	• Loss of Tx Data – The modulator indicates a loss of sync (framed modes) and transmits Null Packets in the data portion of the frame. • Tx Clock PLL Program Error • Data Violations (Tx) • FIFO Faults
ASI Input Select	Input J4 or Input J5
ASI Data Loop BW Selection	Wide and Narrow (Tx Input Data)
PCR Jitter (RX Output)	• Less than 100ns after settling • Settling to < 500ns, 20 seconds • Peak PCR jitter < 1000ns typical during settling

Chapter 9. CDI-60 HSSI INTERFACE MODULE

9.1 Introduction

The CDI-60 HSSI Interface (**Figure 9-1**) is a plug-in module that is installed into the rear of the CDM-710 Broadcast Satellite Modem chassis. It provides physical and electrical connection between the external terrestrial device and the internal circuitry of the modulator or demodulator.

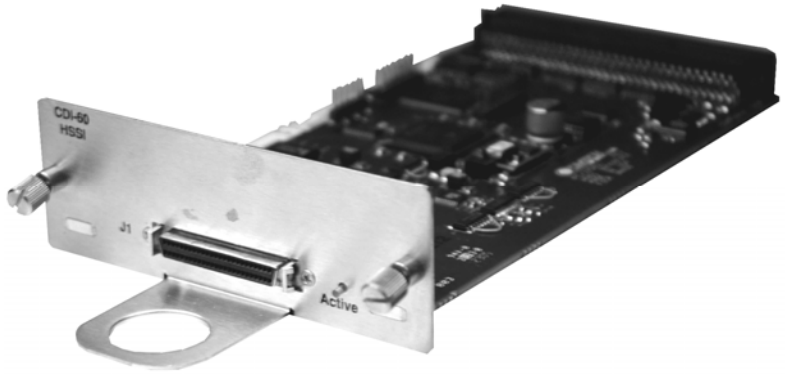


Figure 9-1. CDI-60 HSSI Interface Module

By convention, a modem is **D**ata **C**ommunications **E**quipment (DCE) where Tx data enters the data interface and Rx data exits. The plug-in interface has full duplex capability. In addition, the module is automatically configured for simplex-transmit or simplex-receive operation when the module is plugged into a simplex chassis configured for 'modulator only' or 'demodulator only' operation.

Slot 1 of the CDM-710 – located at the center right of the chassis rear panel – is intended for the dedicated placement of a CDI-40 ASI or CDI-60 HSSI Interface module. Slot 2 – located at the right side end of the chassis rear panel – is assigned a blank panel or is restricted to the dedicated placement of a CDI-70 10/100/1000 Base-T Gigabit Ethernet (GigE) Interface module, depending upon configurations allowed at time of order.

For a table of the applicable interfaces and installable combinations, refer to **Sect. 1.3.5 Allowable Data Interface Combinations**.

9.2 Physical Description

Figure 9-2 depicts the block diagram for the interface. The HSSI Interface is implemented on a 3.95 x 7.022 inch (10.03 x 17.83 cm) PCB. Connection to the modem is provided when the 96-pin DIN connector is engaged into the modem slot.

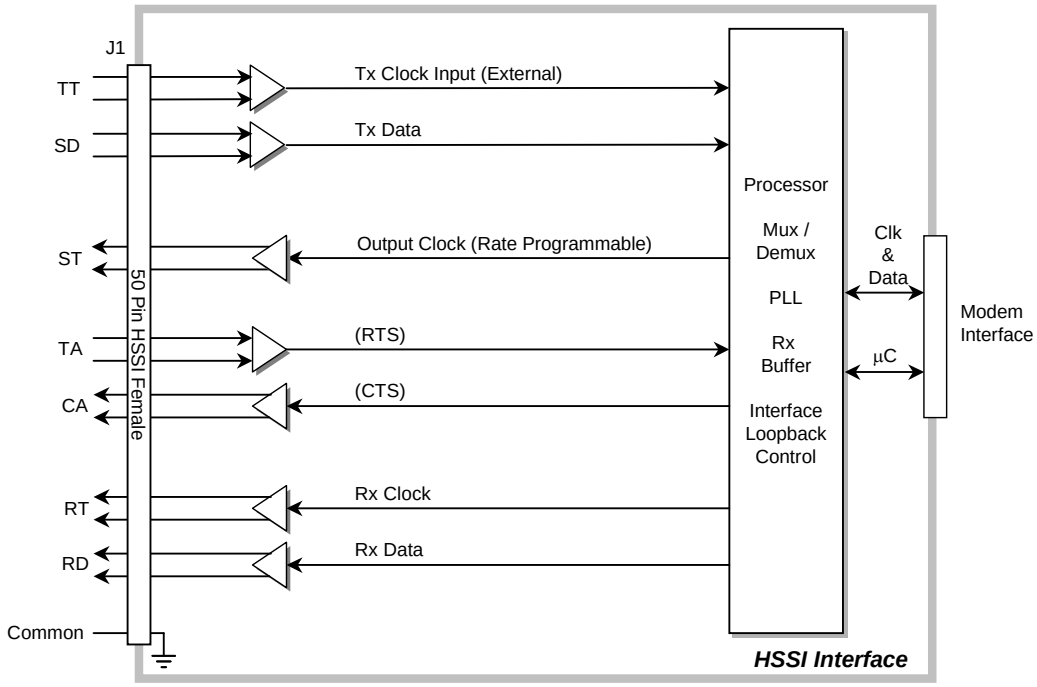


Figure 9-2. CDI-60 HSSI Interface Module Block Diagram

Figure 9-3 shows the CDI-60 HSSI interface, looking towards the real panel. The 50-pin SCSI-2 connector serves as the data port, and a Light-Emitting Diode (LED) labeled **Activity** lights green when the interface is enabled.

The CDI-60 HSSI interface provides:

- A single HSSI interface;
- DCE Connection;
- ST clock is sourced to the terrestrial interface for use as reference by DTE;
- TT is treated as an incoming External Clock, and the interface phase locks to it;
- TA / CA is supported.

The connector pinout for the interface is provided in **Sect. 9.2.1**; a summary of specifications for the interface is provided in **Sect. 9-3**.

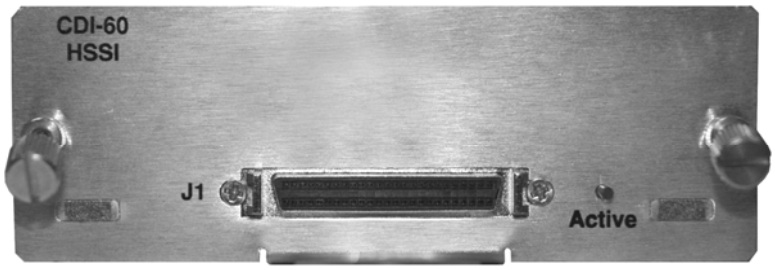


Figure 9-3. CDI-60 HSSI Interface Module – Rear Panel View

9.2.1 Connector Pinout

As shown in **Figure 9-3**, the CDI-60 HSSI Interface has a 50-pin female SCSI-2 (mini-D) connector; the pinout is as follows:

CDI-60 HSSI/EIA-613 Interface Connector Pinout					
Signal Function	HSSI Signal	EIA-613 Circuit	Pin # (+,-)	Circuit Direction	Comment
Signal Ground	SG	102	1, 26		Ground
Receive Timing	RT	115	2, 27	From DCE	
DCE Available	CA	107	3, 28	From DCE	
Receive Data	RD	104	4, 29	From DCE	
Loopback circuit C	LC	undefined	5, 30	From DCE	Not used
Send Timing	ST	114	6, 31	From DCE	
Signal Ground	SG	102	7, 32		Ground
DTE Available	TA	108/2	8, 33	to DCE	
Terminal Timing	TT	113	9, 34	to DCE	
Loopback circuit A	LA	143	10, 35	to DCE	Not used
Send Data	SD	103	11, 36	to DCE	
Loopback Circuit B	LB	144	12, 37	to DCE	Not used
Signal Ground	SG	102	13, 38		Ground
Not used		undefined	14, 39		Not used
TX DVALID		undefined	15, 40		Not used
reserved (to DCE)			16, 41		Not used
reserved (to DCE)			17, 42		Not used
reserved (to DCE)			18, 43		Not used
Signal Ground	SG	102	19, 44		Ground
		undefined	20		Not used
		undefined	45		Not used
		undefined	21		Not used
reserved (to DTE)			46		Not used
		undefined	22, 47	from DCE	Not used
		undefined	23, 48	from DCE	Not used
Test Mode	TM	142	24, 49	from DCE	Not used
Signal Ground	SG	102	25, 50		Ground

9.3 General Specifications

General Specification		
Data Rate Range		1 to 70 Mbps Note: HSSI data rate limit of 70 Mbps may be reached before symbol rate limit is reached.
Interfaces Per Module		One HSSI
Signals Supported		ST, TT (or external) , SD, TA, CA, RT, RD, SG
Connector		DCE, 50-pin mini-D female per EIA-613 (HSSI)
Electrical		Per EIA-612 (10KH ECL compatible).
Electrical Typical		Differential output voltage: ≥ 590 mV pp into 110 load Differential Input voltage: 150 to 1000 mV pp with 110 load
Minimum Buffer Size		5.0 mS smallest buffer setting, 0.1 mS step size, 32 mS maximum size
Impedance	Rx	110 for TT, SD, TA
	Tx	ST, CA, RT, RD will drive 110 and meet HSSI voltage levels
Signal Characteristics		The A terminal is negative with respect to the B terminal for a binary 0 (Space or OFF) state. The A terminal is positive with respect to the B Terminal for a binary 1 (Mark or ON) state.
Clock / Data Relationship		The data transitions occur during the OFF to ON transition of the clock. Data is stable during the ON to Off transition of the clock.
Tx Clock Modes		TT (Input clock) continuous. ST (output clock) is continuous output, programmable in 1 bps steps or phase locked to satellite clock
Rx Clock Modes		RT (output clock) is continuous from satellite, ST (internal clock), continuous from TT
Gap Clock (See Figure 9-4)		Not allowed – Send ST to external equipment so it will return a continuous clock
Tx / Rx Clock		Asymmetrical clocking with Rx Doppler buffer disabled
Acquisition Range		Programmed Tx data rate ± 100 ppm
TA / CA	Default	CA looped to TA
	Selection:	CA is asserted when there is no modem fault
Test		I/O Loopback per the Appendix Interface Loopback per the Appendix
Operation		Simplex (Tx only or Rx only) or full duplex
Signal Sense		Programmable Normal or Inverted for TT and TD, RT and RD
Modules Per Modem		The interface operates in Slot 1, Slot 2, or both slots.
Cable Length to 52 Mbps		2 m (6 ft) nominal, up to 15 m (49 ft) maximum – Note higher data rates usually require shorter cable lengths.
LED		Green LED indicates channel is enabled
Environmental and Physical Specifications		
Operating Temperature		0 to 50ºC (32 to 122ºF)
Storage Temperature		-40 to +70ºC (-40 to 158ºF)
Humidity		95% maximum, non-condensing
Mechanical		Compatible with CDM-700 / 800 slots
Agency Approval		CE in conjunction with the modem

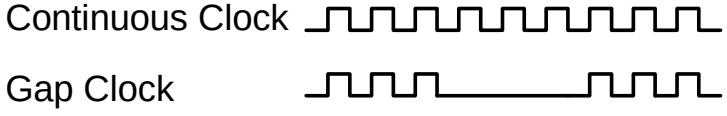


Figure 9-4. Continuous and Gap Clock at TT

Chapter 10. CDI-70 1000 Base-T GIGABIT ETHERNET (GigE) INTERFACE MODULE

10.1 Introduction

The CDI-70 1000 Base-T Gigabit Ethernet (GigE) Interface (**Figure 10-1**) – referred to hereafter as the CDI-70 or the GigE Interface – is a plug-in module that is installed into the rear of the CDM-710 Broadcast Satellite Modem chassis. It performs a Motion Picture Expert Group (MPEG-2) packet decapsulation operation on ingress **I**nternet **P**rotocol (IP) packets received from the **L**ocal **A**rea **N**etwork (LAN). MPEG-2 packets are extracted from the active (of up to two multicast) connection and forwards the extracted MPEG-2 packets to **W**ide **A**rea **N**etwork (WAN) (satellite connection). In addition, an MPEG-over-IP transmit function is performed, in which MPEG-2 packets are received from the WAN and are encapsulated in IP packets and transmitted to the LAN (egress).

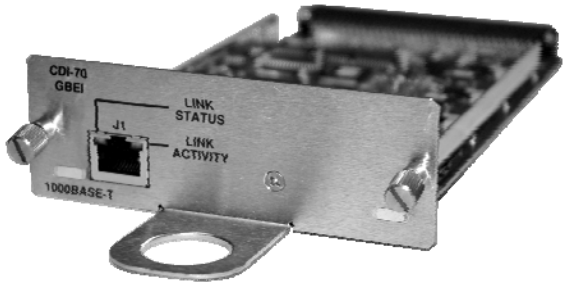


Figure 10-1. CDI-70 10/100/1000 Base-T Gigabit Ethernet (GigE) Interface Module

Monitor and **C**ontrol (M&C) information is not supported on the CDI-70 but is available through the 10/100 Base-T remote port of the modem. The CDI-70 supports data rates from 1.5Mbps to either 80.376 Mbps with SMPTE 2022 (formerly Pro-MPEG COP3) FEC enabled or 124 Mbps with SMPT 2022 / Pro-MPEG COP3 FEC disabled.

Due to backplane limitations, Slot 1 of the CDM-710 – located at the center right of the chassis rear panel – is typically filled with a blank panel or is reserved for a CDI-40 ASI or CDI-60 HSSI

Interface module; Slot 2 – located at the right side end of the chassis rear panel – serves as the dedicated slot for the CDI-70 1000 Base-T Gigabit Ethernet (GigE) Interface module.

For a table of the applicable interfaces and installable combinations, refer to **Sect. 1.3.5 Allowable Data Interface Combinations**.

10.2 Physical Description

The CDI-70 1000 Base-T Gigabit Ethernet (GigE) Interface is implemented on a 3.95 x 7.022 inch (10.03 x 17.83 cm) PCB. Connectivity to the CDM-710 is implemented with a 96-pin DIN receptacle.

The LAN interface consists of a single IEEE 802.3ab 1000 Base-T copper-compliant female RJ-45 connector – refer to **Sect. 10.3** for the connector pinout. This connector features Light-Emitting Diode (LED) indicators for **Link Status** and **Link Activity**.

Figure 10-2 shows a block diagram for the CDI-70 interface.

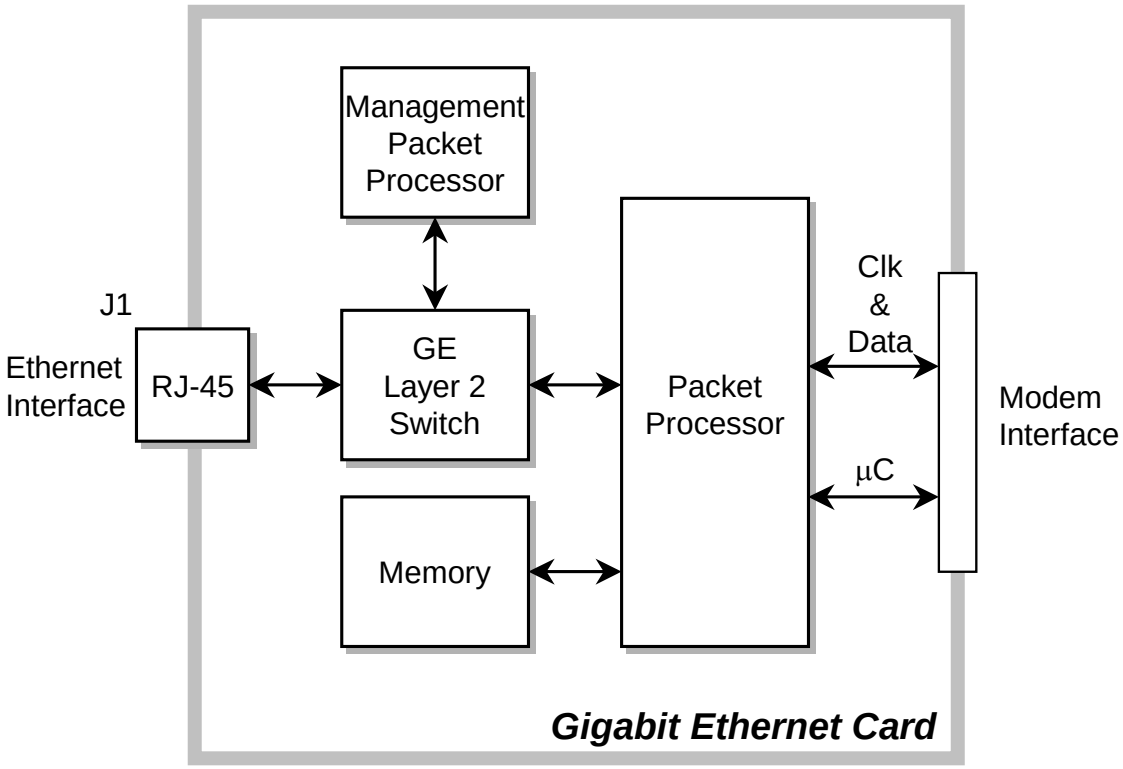
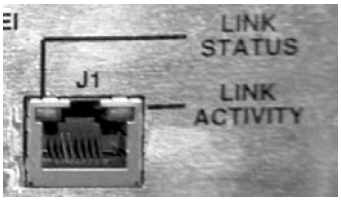


Figure 10-2. CDI-70 GigE Interface Module Block Diagram

10.3 J1 Connector Pinout, RJ45



The J1 LAN interface is comprised of one IEEE 802.3ab 1000Base-T copper compliant female RJ-45 connector. This connector features Light-Emitting Diode (LED) indicators labeled **LINK STATUS** and **LINK ACTIVITY**. The connector pinout is as follows:

Pin #	Description	Direction
1	BI_DA+	bidirectional
2	BI_DA-	bidirectional
3	BI_DB+	bidirectional
4	BI_DC+	bidirectional
5	BI_DC-	bidirectional
6	BI_DB-	bidirectional
7	BI_DD+	bidirectional
8	BI_DD-	bidirectional

10.4 General Specifications

Specification	Feature	Description
General	Data Framing Formats	10/100/1000BaseT interface: RFC 894 “Ethernet”
	Connectors	RJ-45 female, 100Ω
	Electrical Properties	Per IEEE 802.3ab
	Packet Types	IPV4, RFC 894
	Signal Types	Serial data
	Voltage Level	Per IEEE- 802.3ab
	Ingress PDV (packet delay variation) tolerance	60 ms to either end
	Flow Control	None
	Cable Length, Maximum	100 meters CAT-5 cable, patch cords and connecting hardware, per ISO/IEC 11801:1995 and ANSI/EIA/TIA-568-A (1995)
	Hot Pluggable (cable)	Yes
	Hot Pluggable (card)	No
	LEDs	Link Status, link activity
	Data Rate	1.5 Mbps to 80.376 Mbps (COP3 FEC enabled) 1.5 Mbps to 124 Mbps (COP3 FEC disabled)
	FEC Method	SMPTE 2022 / Pro-MPEG COP3 Annex A, column FEC
	Fec Streams	0 or 1; user slectable, column offset supported (Pro-MPEG COP3 Annex A)
	MPEG-2 TS	7 cells per media packet
	MPEG-2 Cell Size	188 bytes
	Ingress Redundancy	Dual multicast streams
	Egress Redundancy	Not supported
Monitor and Control (M&C)	1000Base-T Link Statistics	Ingress good octets Ingress bad octets Ingress unicast packets Ingress broadcast packets Ingress multicast packets Ingress pause packets Ingress undersize packets Ingress fragments Ingress oversize packets Ingress jabber Ingress RX errors Ingress Frame Check Sequence Errors Egress octets Egress unicast packets Egress broadcast packets Egress multicast packets
	WAN Port Statistics	Egress octets Egress unicast packets Egress broadcast packets Egress multicast packets Media packets received Recovered media packets Unrecoverable media packets UDP checksum violations Non-compliant packets Packets dripped Null packets due to underrun

Specification	Feature	Description
Monitor and Control (M&C) (continued)	WAN Port Statistics (cont.)	Null packets due to out-of-sync condition Overrun events Underrun events Out-of-sync events Ingress octets Ingress unicast Ingress broadcast packets Ingress multicast packets
	Management Port Statistics	Ingress good octets Ingress bad octets Ingress unicast packets Ingress broadcast packets Ingress multicast packets Ingress pause packets Ingress undersize packets Ingress fragments Ingress oversize packets Ingress jabber Ingress RX errors Ingress Frame Check Sequence Errors Egress octets Egress unicast packets Egress broadcast packets Egress multicast packets
	Controlled Functions	Data Rate Loss of data: Mask as Fault or Alarm Ingress buffer violation timeout (100ms. to 1s.) Management IP Address and Mask Ingress Multicast Group Address 1 Ingress Multicast Group Address 2 Ingress Multicast Source Address 1 Ingress Multicast Source Address 2 Tx data rate Tx Enable/Disable Ingress UDP port base number Ingress FEC enable/disable Egress Multicast Group Address Egress (to LAN) Enable/Disable Egress UDP destination port base number Egress UDP source port base number Egress FEC enable/disable Egress Tx FEC Configuration (L, D)
	Monitored Functions	Loss of Tx Data (Data Connector Removed): Indicates a loss of signal and transmits (to WAN) MPEG null TX clock PLL program error Buffer status 10/100/1000Base-T Link Status
	Supported Protocols	ICMP RFC-792 IGMP V3 RFC-3376

10.5 Flash Upgrading the CDI-70 GigE Interface

IMPORTANT

A CDM-710/710L Broadcast Satellite Modem running Firmware Ver. 4.1.6 or higher requires a CDI-70 1000 Base-T Gigabit Ethernet Interface running Firmware Ver. 1.1.2 or higher.

The CDM-710's CDI-70 GigE Interface module contains its own processor and memory. On occasion, CEFD may release new software to fix anomalies or add functionality to this interface. Both the CDM-710 and the CDI-70 use 'flash memory' technology internally. This makes software upgrading very simple, and updates can now be obtained via the Internet (**Figure 10-3**), E-mail, or on CD.

This section outlines the complete upgrading process as follows:

- New firmware can be downloaded via the Internet to an external PC.
- The upgrade can be performed without opening the unit by simply connecting the GigE Interface's 'J1' 10/100/1000 Ethernet Traffic port to the Ethernet port of the external PC.
- Once downloaded, the firmware update is transferred using the CEFD application **CReflash.exe**.

For complete information about firmware numbers, file versions, and formats, see **Chapter 4. FLASH UPGRADING.**

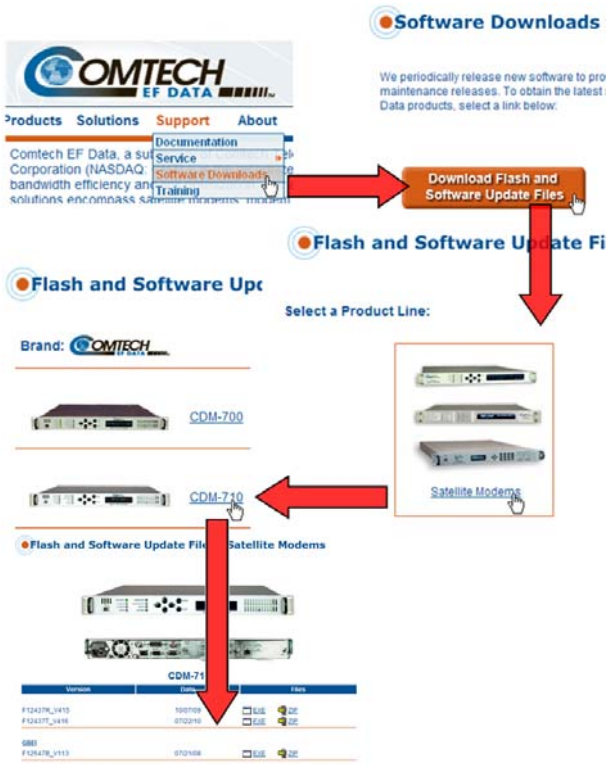


Figure 10-3. Flash Update via Internet

10.5.1 CDI-70 GigE Interface Firmware Upgrade Procedure

Step	Procedure
1	**Identify the CDI-70 firmware product required for download:** • ***From the CDM-710 front panel:*** **SELECT: UTIL→ Firmware→ Info→ Image# (Image1** *or* **Image2)→ Interfaces→ GBEI** • ***From the Serial Console port:*** View the CDI-70 information by selecting **Operations**, then selecting **Maintenance/Unit Information**. • ***From Telnet via the 10/100 Ethernet Traffic port:*** View the CDI-70 information by selecting **Operations**, then selecting **Maintenance/ Unit Information**. • ***From HTTP Web Server Inteface via the 10/100 Ethernet Traffic port****:* View the CDI-70 information by selecting the **MAINT** tab, then selecting the **Unit Info** hyperlink.
2	**Create a temporary folder** (directory) on an external PC: • ***For Windows Explorer:*** Select **File > New > Folder** to create a new folder, then rename it from "**New Folder**" to "**temp**" or another convenient, unused name. Assuming "**temp**" works, a "***c:\temp***" folder should now be created. **Note:** The drive letter **c:** is used in this example. Any valid writable drive letter can be used. • ***For Windows Command-line:*** Click **[Start]** on the Windows taskbar, then click the "**Run...**" icon (or, depending on Windows OS versions *prior* to Windows 95, click the "**MS-DOS Prompt**" icon from the Main Menu). Then, to open a Command-line window… o ***For Windows 95 or Windows 98*** – Type "**command**". o ***For any Windows OS versions later than Windows 98*** – Type "**cmd**" *or* "**command**". ***Alternately,*** from **[Start],** select ***All Programs > Accessories > Command Prompt***. At the Command-line prompt (c:\>), type "**mkdir temp**" or "**md temp**" (without quotes – **mkdir** and **md** stand for *make directory*). This is the same as creating a new folder using Windows Explorer. There should now be a "***c:\temp***" subdirectory created (where **c:** is the drive letter used in this example).
3	**Download the correct firmware file** to this temporary folder. As shown in **Figure 10-3**: a) **Go online** to: www.comtechefdata.com; b) From the ***Home page*** menu bar, **click** the ***Support*** tab; c) **Click** the ***Software Downloads*** drop-down *or* hyperlink from the ***Support*** page; d) **Click** the ***Download Flash and Software Update Files*** icon; e) **Click** the ***(Select a Product Line:) Satellite Modems*** hyperlink provided on the ***Flash and Software Update Files*** page; f) **Select** the **CDM-710** product hyperlink from the ***Comtech Brand*** column; g) **Select** the desired CDI-70 firmware version hyperlink (the firmware number for the CDM-710's CDI-70 Gigabit Ethernet Interface module is **FW12547**).
4	**Extract the files** to the temporary folder on the PC. A minimum of four files should be extracted: • **FW12547x.bin**, where "x" denotes the revision letter for the bulk image file. • **ReleaseNotes_FW12547_vxxx.pdf** – Where "xxx" is the complete version number; • **CReflashVx.zip** – The archive file containing the executable used to upload firmware to the CDI-70. • **CReflash_readme_GBEI1.TXT**– Installation notes for the CReflash app. **To confirm that the files have been extracted** to the specified temporary folder on the PC, using Command-line, type **cd c:\temp** to change to the temporary directory created in ***Step 2***, then use the **dir** command to list the files extracted from the downloaded archive file.

5	**Connect** the client PC to the CDI-70 GigE Interface module via an Ethernet hub or a switch, or directly to the PC with a crossover cable.
6	**Enable** the CDI-70 on the CDM-710 in order to enable the GigE Interface's PHY interface. IMPORTANT ***The CDI-70's firmware can only be loaded via the Ethernet M&C port; do not use the J4 Ethernet M&C port.***
7	**Reflash the unit.** a) **Double-click** on *CReflash.exe* to start the Comtech Modem Reflash Application (shown at right): b) **Type the IP Address** assigned to the CDI-70 in the *IP Address:* field. c) **Enter** the bulk image load by either (1) typing the path and filename, or (2) using the **[Browse]** button to select the file. d) **Leave** the *Remote Filename* selection as **"bulk:"**. e) **Click [Start].** f) The *CReflash.exe* executable automatically FTPs the filename to the IP address entered, and displays the progress of the update. IMPORTANT ***Once the CReflash.exe application has been started, the program will not respond to user input for approximately five (5) minutes. During this time, a message indicating this progress phase will also display on the modem's front panel.*** • ***DO NOT CLOSE THE CREFLASH.EXE PROGRAM ON THE PC!*** • ***DO NOT REBOOT THE MODEM!*** g) ***When the update is complete:*** The message **'Successful!'** appears in the **[/]** status field of the CReflash.exe application window; a similar message displays on the modem's front panel. h) **Cycle power** to the CDM-710 to have the new firmware loaded to the CDI-70. i) **Verify** that the version update has successfully loaded upon reboot, using one of the available query methods provided in ***Step 1***.

Appendix A. REMOTE CONTROL

A.1 Overview

This appendix describes the protocol and message command set for remote monitor and control of the CDM-710 Broadcast Satellite Modem.

The electrical interface is either an EIA-485 multi-drop bus (for the control of many devices) or an EIA-232 connection (for the control of a single device), and data is transmitted in asynchronous serial form using ASCII characters. Control and status information is transmitted in packets of variable length in accordance with the structure and protocol defined in later sections.

A.2 EIA-485

For applications where multiple devices are to be monitored and controlled, a full-duplex (or 4-wire) EIA-485 is preferred. Half-duplex (2-wire) EIA-485 is possible, but is not preferred.

In full-duplex EIA-485 communication there are two separate, isolated, independent differential-mode twisted pairs, each handling serial data in different directions. It is assumed that there is a 'Controller' device (a PC or dumb terminal), which transmits data in a broadcast mode via one of the pairs. Many 'Target' devices are connected to this pair, all of which simultaneously receive data from the Controller. The Controller is the only device with a line-driver connected to this pair – the Target devices only have line-receivers connected.

In the other direction, on the other pair each Target has a tri-stateable line driver connected, and the Controller has a line-receiver connected. All the line drivers are held in high-impedance mode until one – and only one – Target transmits back to the Controller.

Each Target has a unique address, and each time the Controller transmits in a framed 'packet' of data, the address of the intended recipient Target is included. All of the Targets receive the packet, but only one – the intended – will reply. The Target enables its output line driver and transmits its return data packet back to the Controller in the other direction, on the physically separate pair.

EIA-485 (full duplex) summary:

- Two differential pairs: one pair for Controller-to-Target, one pair for Target -to-Controller.
- Controller-to-Target pair has one line driver (Controller), and all Targets have line-receivers.
- Target-to-Controller pair has one line receiver (Controller), and all Targets have tri-state drivers.

A.3 EIA-232

This is a much simpler configuration in which the Controller device is connected directly to the Target via a two-wire-plus-ground connection. Controller-to-Target data is carried via EIA-232 electrical levels on one conductor, and Target -to-Controller data is carried in the other direction on the other conductor.

A.4 Basic Protocol

Whether in EIA-232 or EIA-485 mode, all data is transmitted as asynchronous serial characters suitable for transmission and reception by a UART. In this case, the asynchronous character format supported is 8N1. The baud rate may vary between 1200 and 57600 baud.

All data is transmitted in framed packets. The Controller is assumed to be a PC or ASCII dumb terminal, which is in charge of the process of monitor and control. The Controller is the only device which is permitted to initiate, at will, the transmission of data. Targets are only permitted to transmit when they have been specifically instructed to do so by the Controller.

All bytes within a packet are printable ASCII characters less than ASCII code 127. In this context, the Carriage Return and Line Feed characters are considered printable.

All messages from Controller-to-Target require a response, with one exception: this will be either to return data, which has been requested by the Controller, or to acknowledge reception of an instruction to change the configuration of the Target. The exception to this is when the Controller broadcasts a message (such as Set time/date) using Address 0, when the Target is set to EIA-485 mode.

A.5 Packet Structure

Controller-to-Target						
Start of Packet	Target Address	Address Delimiter	Instruction Code	Code Qualifier	Optional Arguments	End of Packet
< ASCII code 60 (1 character)	 (4 characters)	/ ASCII code 47 (1 character)	 (3 characters)	= or ? ASCII codes 61 or 63 (1 character)	 (n characters)	Carriage Return ASCII code 13 (1 character)

Example: <0135/TFQ=0070.2345{CR}

Target-to-Controller						
Start of Packet	Target Address	Address Delimiter	Instruction Code	Code Qualifier	Optional Arguments	End of Packet
> ASCII code 62 (1 character)	 (4 characters)	/ ASCII code 47 (1 character)	 (3 characters)	=, ?, !, or * ASCII codes 61, 63, 33, or 42 (1 character)	 (From 0 to n characters)	Carriage Return, Line Feed ASCII codes 13,10 (2 characters)

Example: >0654/RSW=32{CR}{LF}

A.5.1 Start of Packet

Controller-to-Target: This is the character '<' (ASCII code 60).

Target-to-Controller: This is the character '>' (ASCII code 62).

Because this is used to provide a reliable indication of the start of packet, these two characters may not appear anywhere else within the body of the message.

A.5.2 Target Address

Up to 9999 devices can be uniquely addressed. In EIA-232 applications this value is set to 0. In EIA-485 applications, the permissible range of values is 1 to 9999. It is programmed into a Target unit using the front panel keypad.

IMPORTANT

The Controller sends a packet with the address of a Target – the destination of the packet. When the Target responds, the address used is the same address, to indicate to the Controller the source of the packet. The Controller does not have its own address.

A.5.3 Address Delimiter

This is the “forward slash” character '/' (ASCII code 47).

A.5.4 Instruction Code

This is a three-character alphabetic sequence, which identifies the subject of the message. Wherever possible, the instruction codes have been chosen to have some significance – e.g., **TFQ** for transmit frequency, **RMD** for receive modulation type, etc. This aids in the readability of the message, should it be displayed in its raw ASCII form. Only upper case alphabetic characters may be used (A-Z, ASCII codes 65 - 90).

A.5.5 Instruction Code Qualifier

This is a single character, which further qualifies the preceding instruction code. Code Qualifiers obey the following rules:

1. ***From Controller-to-Target***, the only permitted values are:

Symbol	Definition
= **(ASCII code 61)**	The ‘=’ code is used as the Assignment Operator (AO) and is used to indicate that the parameter defined by the preceding byte should be set to the value of the argument (s) which follow it. **Example:** in a message from Controller-to-Target, TFQ=0070.0000 would mean “set the transmit frequency to 70 MHz.”
? **(ASCII code 63)**	The ‘?’ code is used as the Query Operator (QO) and is used to indicate that the Target should return the current value of the parameters defined by the preceding byte. **Example:** in a message from Controller-to-Target, TFQ? Would mean “return the current value of the transmit frequency.”

2. ***From Target-to-Controller***, the only permitted values are:

Symbol	Definition
= **(ASCII code 61)**	The ‘=’ code is used in two ways: **First,** if the Controller has sent a query code to a Target **Example:** TFQ? (meaning ‘what’s the Transmit frequency?’), the Target would respond with TFQ=xxxx.xxxx, where xxxx.xxxx represents the frequency in question. **Second,If** the Controller sends an instruction to set a parameter to a particular value, then, providing the value sent is valid, the Target will acknowledge the message by replying with TFQ=(with no message arguments)
? **(ASCII code 63)**	If the Controller sends an instruction to set a parameter to a particular value, then, if the value sent is not valid, the Target will acknowledge the message by replying (for example) with TFQ? (with no message arguments). This indicates that there was an error in the message sent by the Controller.

! **(ASCII code 33)**	If the Controller sends an instruction code which the Target does not recognize, the Target will acknowledge the message by echoing the invalid instruction, followed by the ! character. **Example:** XYZ!
***** **(ASCII code 42)**	If the Controller sends an instruction to set a parameter to a particular value, then, if the value sent is valid, BUT the modulator will not permit that particular parameter to be changed at this time, the Target will acknowledge the message by replying (for example) with TFQ* (with no message arguments).
# **(ASCII code 35)**	If the Controller sends a correctly formatted command, BUT the modulator is not in remote mode, it will not allow reconfiguration and will respond with TFQ#
~ **(ASCII Code 126)**	If a message was sent via a local modem to a distant end device or ODU, the message was transmitted transparently through the local modem. In the event of the distant-end device not responding, the local modem would generate a response. **Example:** 0001/RET**~**, indicating that it had finished waiting for a response and was now ready for further comms.

A.5.6 Optional Message Arguments

Arguments are not required for all messages. Arguments are ASCII codes for the characters 0 to 9 (ASCII codes 48 to 57), period (ASCII code 46) and comma (ASCII code 44).

A.5.7 End Of Packet

Controller-to-Target: This is the ‘Carriage Return’ character (ASCII code 13).

Target-to-Controller: This is the two-character sequence ‘Carriage Return’, ‘Line Feed’ (ASCII codes 13 and 10). Both indicate the valid termination of a packet.

A.6 Remote Commands / Queries

Index Notes: Where Column 'C' = Command and Column 'Q' = Query, columns marked 'X' designate instruction code as *Command only*, *Query only*, or *Command/Query*.

CODE	C	Q	PAGE
A			
AEQ	X	X	A-21, A-38
ARF	X	X	A-21, A-38
ASW	X	X	A-8, A-21, A-34, A-38
ATF	X	X	A-8, A-38
B			
BER		X	A-21, A-38
C			
CAE	X		A-8, A-21, A-38
CID	X	X	A-8, A-21, A-39
CLD	X		A-8, A-21, A-39
CST	X		A-8, A-22, A-39
D			
DAY	X	X	A-8, A-22, A-39
DLK		X	A-22, A-39
E			
EBA	X	X	A-22, A-39
EBN		X	A-22, A-39
EID		X	A-9, A-23, A-40
ERF	X	X	A-9, A-22, A-40
ESN		X	A-10, A-23, A-41
ESW	X	X	A-10, A-23, A-41
F			
FLT		X	A-10, A-24, A-41
FRW		X	A-11, A-25, A-43

CODE	C	Q	PAGE
G			
GEF	X	X	A-25, A-43
GEG	X	X	A-25, A-43
GEP	X	X	A-26, A-43
GFE	X	X	A-11
GFM	X	X	A-26, A-43
GFP	X	X	A-11, A-43
GIP	X	X	A-11, A-25, A-43
GMI	X	X	A-12, A-44
GSA	X	X	A-12. A-44
GSI	X	X	A-12, A-44
GSM	X	X	A-12, A-44
GSP	X	X	A-12, A-44
GTM	X	X	A-12, A-44
GTO	X	X	A-12, A-44
H			
I			
IEP	X		A-13, A-26, A-45
IMG	X		A-13, A-26, A-45
IMP	X	X	A-13, A-26, A-34
IPA	X	X	A-13, A-26, A-45
IPG	X	X	A-13, A-26, A-45
ITF		X	A-13, A-27, A-45
J			
K			

CODE	C	Q	PAGE
L			
LNK		X	A-27, A-45
LRS	X	X	A-13, A-27, A-45
M			
MAC		X	A-14, A-27, A-45
MGC	X	X	A-52
MSK	X	X	A-14, A-27, A-46
N			
NUE		X	A-14, A-27, A-46
O			
P			
PER		X	A-27, A-46
Q			
R			
RAR	X	X	A-27, A-46
RBS	X	X	A-28, A-46
RBT	X		A-14, A-28, A-46
RCI	X	X	A-28, A-46
RCK	X	X	A-28, A-47
RCR	X	X	A-20, A-28, A-37
RDI	X	X	A-28, A-47
RDR		X	A-28, A-47

CODE	C	Q	PAGE
RED	X	X	A-14, A-29, A-47
RFO		X	A-29, A-47
RFQ	X	X	A-29, A-48
RFS		X	A-29, A-48
RFT		X	A-29, A-48
RGS	X	X	A-29, A-48
RIE	X	X	A-30, A-48
RMD	X	X	A-20, A-37
RMM	X	X	A-20, A-37
RNE		X	A-15, A-30, A-49
RPI	X	X	A-30, A-49
RSL		X	A-30, A-49
RSR	X	X	A-21, A-38
RSW	X	X	A-32, A-49
RTM	X	X	A-32, A-50
S			
SNO		X	A-14, A-31, A-50
SWR		X	A-14, A-31, A-50
T			
TAB	X	X	A-15, A-34
TAR	X	X	A-15, A-34
TCI	X	X	A-15, A-34
TCR	X	X	A-7, A-33
TDI	X	X	A-16, A-34
TDR		X	A-16, A-35
TFQ	X	X	A-16, A-35
TFS	X	X	A-16, A-35
TFT		X	A-16, A-35

CODE	C	Q	PAGE
TGS	X	X	A-16, A-35
TIE	X	X	A-17, A-35
TIM	X	X	A-17, A-31, A-50
TIP	X	X	A-17, A-36
TLP	X	X	A-17, A-36
TMD	X	X	A-7, A-33
TMM	X	X	A-7, A-33
TMP		X	A-17, A-31, A-50
TPI	X	X	A-17, A-36
TPL	X	X	A-18, A-36
TPT	X	X	A-18, A-50
TRC	X	X	A-18, A-32, A-51
TSI	X	X	A-19, A-36
TSR	X	X	A-7, A-33
TST	X	X	A-19, A-51
TTM	X	X	A-19, A-36
TXO	X	X	A-19
U			
V			
W			
X			
Y			
Z			

Note: In the tabulature that follows, the following codes are used in the 'Response to Command' column (per Sect. A.5.5 Instruction Code Qualifier):

= Message ok
? Received ok, but invalid arguments found
* Message ok, but not permitted in current mode
# Message ok, but unit is not in Remote mode

A.6.1 Modulator

Priority System = (Highest priority) TMM, TMD, TCR, and TSR (Lowest Priority), as indicated by **shading**. Any change to a higher priority parameter can override any of the parameters of lower priority.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Mode	TMM=	1 byte	Command or Query. Tx Mode, where: 0=DVB-S 1=DVB-S2 2=DVB-DSNG **Example:** TMM=0 (DVB-S mode selected) **Note:** Refer to **Sect. 1.5 Summary of Specifications** for available code rates, modulation types, and symbol rates for each mode.	TMM= TMM? TMM* TMM#	TMM?	TMM=x
Tx Modulation Type	TMD=	1 byte	Command or Query. Tx Modulation type, where: 0=QPSK 1=8PSK 2=16QAM 3=16APSK 4=32APSK **Example:** TMD=1 (8PSK selected) **Note:** Refer to **Sect. 1.5 Summary of Specifications** for available modulation types for each mode.	TMD= TMD? TMD* TMD#	TMD?	TMD=x
Tx FEC Code Rate	TCR=	1 byte	Command or Query. Tx Code Rate, where: 0 = Rate 3/4 1 = Rate 7/8 2 = Rate 3/5 3 = Rate 4/5 4 = Rate 5/6 5 = Rate 8/9 6 = Rate 9/10 7 = Rate 2/3 8 = Rate 1/2 Depending on FEC type, not all of these selections will be valid. **Example:** TCR=0 (Rate 3/4 selected) **Note:** Refer to **Sect. 1.5 Summary of Specifications** for a list of available code rates for each mode.	TCR= TCR? TCR* TCR#	TCR?	TCR=x
Tx Symbol Rate	TSR=	9 bytes	Command or Query. Tx Symbol Rate, in the form ss.ssssss where: ss.ssssss =Symbol Rate in Msps **Example:** TSR=20.000000 (20 Msps selected)	TSR= TSR? TSR* TSR#	TSR?	TSR=ss.ssssss

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Auto Switch Mode	ASW=	1 byte	Command or Query. Unit returns the redundancy auto/manual mode of the unit in the form x, where: 0 = Manual 1 = Automatic **Example:** ASW=0 (Manual Mode selected)	ASW= ASW? ASW* ASW#	ASW?	ASW=x (See Description of Arguments)
ASI Tx Frame Size	ATF=	2 bytes	Command or Query. Indicates whether the ASI Tx Frame Size is 188 or 204 bytes (ASI card only), in the form sf, where: s = interface slot (1 or 2) f = frame size 0 = 188 bytes 1 = 204 bytes **Example:** ATF=11 (Interface Slot 1 set to 204 byte frame size)	ATF= ATF? ATF* ATF#	ATF?s	ATF=sf
Clear All Stored Events	CAE=	None	Command only. Forces the software to clear the software events log. **Example:** CAE= **Note:** This command takes no arguments	CAE= CAE? CAE* CAE#	N/A	N/A
Circuit ID String	CID=	24 bytes	Command or Query. Sets or queries the user-defined Circuit ID string, which is a fixed length of 24 characters. Valid characters include: Space ( ) * + – , . / 0 9 and A thru Z	CID= CID? CID* CID#	CID?	CID=xxxxxxxxxxxxxxxxxxxxxxxx
Configuration Load	CLD=	1 byte	Command Only Retrieves a previously stored configuration from the specified configuration location (0 to 9). **Example:** CLD=4 (retrieve configuration from Location 4)	CLD= CLD? CLD* CLD#	N/A	N/A
Configuration Save	CST=	1 byte	Command only. Stores the current configuration in the specified configuration location (0 to 9). **Example:** CST=4 (store the current configuration in Location 4)	CST= CST? CST* CST#	N/A	N/A
Real-time Clock Date	DAY=	6 bytes	Command or Query. A date in the form ddmmyy, where dd = day of the month (01 to 31), mm = month (01 to 12) yy = year (00 to 99) **Example:** DAY=240457 (April 24, 2057)	DAY= DAY? DAY* DAY#	DAY?	DAY=ddmmyy

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Equipment ID	N/A	23 bytes	Query only. Unit returns equipment identification and configuration, where: **aaa = defines the modulator model number (710)** **b = Modulator configuration**: 1=70/140 Mhz, 2=L-Band **c = Tx Symbol Rate S/W option:** 0 = 15.0 Msps, 1 = 22.5 Msps, 2 = 30.0 Msps, 3 = 37.5 Msps (S1 and DSNG only), 4 = 45.0 Msps (S1 and DSNG only) **d = S/W option Tx 8PSK:** 0=Not installed, 1=Installed **e = S/W option Tx 16-QAM:** 0=Not installed, 1=Installed **f = S/W option Tx 16APSK:** 0=Not installed, 1=Installed **g = S/W option Tx 32APSK:** 0=Not installed, 1=Installed **h = S/W option Tx DVB-S1:** 0=Not installed, 1=Installed **i = S/W option Tx DVB-DSNG:** 0=Not installed, 1=Installed **j = S/W option Tx DVB-S2:** 0=Not installed, 1=Installed **k = Demodulator configuration:** 0=None, 1=70/140 Mhz, 2=L-Band **l = Rx Symbol Rate S/W option:** 0=15.0 Msps, 1 = 22.5 Msps, 2 = 30.0 Msps, 3 = 37.5 Msps (S1 & DSNG only), 4 = 45.0 Msps (S1 & DSNG only) **m = S/W option Rx 8PSK:** 0=Not installed, 1=Installed **n = S/W option Rx 16-QAM:** 0=Not installed, 1=Installed **o = S/W option Rx 16APSK:** 0=Not installed, 1=Installed **p = S/W option Rx 32APSK:** 0=Not installed, 1=Installed **q = S/W option Rx DVB-S1:** 0=Not installed, 1=Installed **r = S/W option Rx DVB-DSNG:**0=Not installed, 1=Installed **s = S/W option Rx DVB-S2:** 0=Not installed, 1=Installed **t = Interface slot #1:** 0 = None, 1 = ASI, 2 = Gigabit Ethernet Interface, 3 = HSSI **u = Interface slot #2:** 0 = None, 1 = ASI, 2 = Gigabit Ethernet Interface, 3 = HSSI	EID? EID* EID#	EID?	EID= aaabcdefghijklmnopqrstu **Notes:** 1. Unit returns 'Not Installed' for Rx options if unit is modulator only. 2. Unit returns 'Not Installed' for Tx options if unit is demodulator only.
External Reference Frequency	ERF=	1 byte	Command or Query. External Reference Frequency, where: 0=Internal 1=External 1 MHz 2=External 2 MHz 3=External 5 MHz 4=External 10 MHz 5=External 20 MHz **Example:** ERF=0 (Internal selected - External reference not used)	ERF= ERF? ERF* ERF#	ERF?	ERF=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Enable Redundancy Switch Mode	ESW=	1 byte, value of 0 or 1	Command or Query. Set redundancy mode in the form x, where : 0 = Disable 1 = Enable **Example:** ESW=1 (Redundancy Mode enabled)	ESW= ESW? ESW* ESW#	ESW?	ESW=x
Faults and Status	N/A	4 bytes	Query only. Unit returns the current fault and status codes for the Unit (hardware), Tx Traffic and Rx Traffic, in the form abcd, where: a = Unit Faults: 0=No faults 1=Framer FPGA Load 2=Power supply fault, +1.5 Volts, Framer Card 3=Power supply fault, +1.5 Volts, Interface #1 4=Power supply fault, +1.5 Volts, Interface #2 5=Power supply fault, +3.3 Volts, Framer Card 6=Power supply fault, +5.0 Volts, Framer Card 7=Power supply fault, +12.0 Volts, Framer Card 8=Power supply fault, -12.0 Volts, Framer Card 9=Power supply fauilt, +18.0 Volts, Framer Card A=FLASH Checksum B=FEC1 Load C=FEC2 Load D=Interface #1 Load E=Interface #2 Load F=192 MHz PLL G=External Reference H=Framer Card Temperature I=Modem Temperature J=Cooling Fans K=Interface #1 Removed L=Interface #2 Removed b = Tx Traffic Status: 0=No faults 1= +1.5V Power Supply Unit (Modulator Card) 2= FPGA Failed to Load (Modulator Card) 3= Symbol Rate PLL Clock 4= Tx Synthesizer Unlocked 5= Tx Digital Clock Manager Unlocked 6= I & Q Baseband Channels are Inactive 7= FPGA Temperature (Modulator Card) 8= Reserved 9= ASI Port Transmit FIFO Empty (Interface 1) A= Reserved B= ASI Port Transmit FIFO Full (Interface 1)	FLT? FLT* FLT#	FLT?	FLT=abcd d=Change in fault status since last poll. **Note:** Each section has faults listed in order of priority. For each section, only the highest priority fault is returned. There maybe multiple faults for each section, but only the highest fault is returned.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Faults and Status (cont.)			C= Reserved D= ASI Port Transmit Data Loss (Interface 1) E= Reserved F= ASI Frame Not Synchronized (Interface 1) G= Reserved H= HSSI TX Clock Failure (Interface 1) I= Reserved J= GBEI Card Datarate > + 200 PPM K= GBEI Card Datarate < - 200 PPM L= GBEI No PHY Link M= Encoder FIFO Empty N= Encoder FIFO Full O= ASI Tx Input Datarate Offset > +110PPM (Interface 1) P= Reserved Q= ASI Tx Input Datarate Offset < -110PPM (Interface 1) R= Reserved S= SERDES Parity Errors c=Rx Traffic Status 0=No faults d=New Faults 0=No new faults 1=New faults, since last check			
Firmware Revisions	N/A	1 byte	Query only. Query the version information of the system. Where: i = Bulk Image number (1 or 2) a = Firmware Image b = Firmware Revision c = Firmware Date **Example:** FRW?1	FRW? FRW* FRW#	FRW?i	FRW={CR}Boot:{CR}a,b,c{CR} Bulki:{CR}a,b,c{CR}a,b,c…
Gigabit FEC Enable	GFE=	2 bytes	Command or Query. Enables the Gigabit FEC mode in the form sn, where: s=Slot (1, 2) n=Enable/Disable 0=Disabled 1=Enabled	GFE= GFE# GFE? GFE*	GFE?s	GFE=sn
Gigabit FEC Base Port	GFP=	6 bytes	Command or Query. Gigabit FEC Base Port number in the form snnnnn, where: s=Slot (1, 2) n=Port Number (0 – 65535)	GFP= GFP# GFP? GFP*	GFP?s	GFP=snnnnn

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Gigabit Management IP Address and Subnet	GIP=	19 bytes	Command or Query. Gigabit Management IP address and subnet mask in the form siii.iii.iii.iii.nn, where: s=Slot (1, 2) i=IP Address n=Netmask	GIP= GIP# GIP? GIP*	GIP?s	GIP=siii.iii.iii.iii.nn
Gigabit Multicast Address	GMI=	17 bytes	Command or Query. Gigabit Multicast Address in the form smiii.iii.iii.iii, where: s=Slot (1, 2) m=Multicast Stream (1, 2) i=IP Address	GMI= GMI# GMI? GMI*	GMI?sm	GMI=smiii.iii.iii.iii
Gigabit Active Stream	N/A	2 bytes	Command or Query. Gigabit Active Stream in the form sm, where: s=Slot (1, 2) m=Stream (1, 2)	GSA= GSA# GSA? GSA*	GSA?s	GSA=sm
Gigabit Source IP Address	GSI=	17 bytes	Command or Query. Gigabit Source IP Address in the form smiii.iii.iii.iii, where: s=Slot (1, 2) m=Multicast Stream (1, 2) i=IP Address	GSI= GSI# GSI? GSI*	GSI?sm	GSI =smiii.iii.iii.iii
Gigabit Stream Mode	GSM=	2 bytes	Command or Query. Gigabit Stream Mode in the form sm, where: s=Slot (1, 2) m=Mode 1=Single Stream 2=Dual Stream (Redundancy Mode)	GSM= GSM# GSM? GSM*	GSM?s	GSM=sm
Gigabit Primary Stream	GSP=	2 bytes	Command or Query. Gigabit Primary Stream in the form sm, where: s=Slot (1, 2) m=Multicast Stream (1, 2)	GSP= GSP# GSP? GSP*	GSP?s	GSP=sm
Gigabit Stream Timeout Mode	GTM=	2 bytes	Command or Query. Gigabit Stream Timeout Mode in the form sm, where: s=Slot (1, 2) m=Mode 0 = Non-revertive 1 = Revertive **Note:** Only used when in Dual Stream Mode. When in redundancy mode, this parameter controls whether the Gigabit Interface switches back and forth between the two input streams for a valid MPEG stream. Revertive (GSM =1) means the interface will switch back and forth between the two streams. Non-revertive is a latching scheme where the interface will only switch to the secondary stream.	GTM= GTM# GTM? GTM*	GTM?s	GTM=sm

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Gigabit Stream Timeout	GTO=	3 bytes	Command or Query. Gigabit Stream Timeout (Only used when in Dual Stream Mode) in the form stt, where: s=Slot (1, 2) t=Timeout in 100 mS intervals (0 – 10)	GTO= GTO# GTO? GTO*	GTO?s	GTO=stt
Initialize Events Pointer	IEP=	None	Command only. Resets internal pointer to allow RNE? queries to start at the beginning of the stored events log.	IEP= IEP? IEP* IEP#	N/A	N/A
Boot Image	IMG=	1 byte	Command only. Boot image selection, where n is the image number: 1=Image #1 2=Image #2 **Example:** IMG=1 (Image #1 selected for booting.)	IMG= IMG? IMG* IMG#	IMG?	IMG=n
Tx Output Impendance	IMP=	1 byte	Command or Query. Tx output impedance in the form x, where: 0=50 Ohm 1=75 Ohm **Example:** IMP=0 (Impedance set to 50 Ohms) **Note:** Setting Tx Impedence is only possible on 70/140 MHz units.	IMP= IMP? IMP* IMP#	IMP?	IMP=x
IP Address	IPA=	18 bytes	Command or Query. Used to set the IP address and network prefix for the 10/100 BaseTx Ethernet management port, in the form xxx.xxx.xxx.xxx.yy, where: xxx.xxx.xxx.xxx is the IP address yy is the network prefix (00..31) **Example:** IPA=010.006.030.001.24	IPA= IPA? IPA* IPA#	IPA?	IPA= xxx.xxx.xxx.xxx.yy
Gateway Address	IPG=	15 bytes	Command or Query. Used to set the Gateway IP addess for the 10/100 Base Tx Ethernet management port, in the form xxx.xxx.xxx.xxx, where: xxx.xxx.xxx.xxx is the IP address **Example:** IPG = 010.006.030.001	IPG= IPG? IPG* IPG#	IPG?	IPG = xxx.xxx.xxx.xxx
Interface Type	N/A	2 bytes	Query only. Interface Type in the form sx, where: s=Defines which interface slot (1 or 2) x=Defines the interface type, where: 0=ASI 1=Gigabit Ethernet 2=HSSI **Example:** ITF?1	ITF? ITF* ITF#	ITF?s	ITF=sx

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Local/Remote Status	LRS=	1 byte	Command or Query. Local/Remote status in the form x, where: 0=Local 1=Serial 2=Reserved 3=Ethernet 4=Serial+Ethernet **Example:** LRS=1 (remote Serial selected)	LRS= LRS? LRS* LRS#	LRS?	LRS=x
Unit MAC Address	N/A	12 bytes	Query only. MAC address of the unit, reported in hexadecimal. **Example:** MAC=0006B000D2A7 (The MAC address of the unit is 00:06:B0:00:D2:A7)	MAC? MAC* MAC#	MAC?	MAC=AABBCCDDEEFF
Unit Alarm Mask	MSK=	2 bytes	Command or Query. Alarm mask conditions, in the form ab, where: a=Tx AIS (0 = Alarm, 1 =Fault, 2 = Masked) b=Spare **Example:** MSK = 00	MSK= MSK? MSK* MSK#	MSK?	MSK=ab
Number of Unread stored Events	N/A	3 bytes	Query only. Unit returns the Number of Unread Events, which remain stored, in the form xxx. **Note:** This means unread over the remote control. **Example:** NUE=126	NUE? NUE* NUE#	NUE?	NUE=xxx
Soft Reboot	RBT=1	1 byte	Command only. Soft Reboot. 1= Reboot System	RBT? RBT* RBT#	N/A	RBT=
Redundancy State	RED=	1 byte	Command or Query. Unit returns the redundancy state of the unit in the form x, where: 0 = Offline 1 = Online **Notes:** 1. This command can be used to force the unit offline, this is done by sending RED=0. This is only valid if redundancy mode is enabled – if redundancy is not enabled, then RED=0 will return an error. The unit cannot be forced online. 2. If the unit is not in redundancy mode, then the unit will always be online. **Example:** RED=0 (force unit offline)	RED= RED? RED* RED#	RED?	RED=x (See Description of Arguments)
Serial Number	N/A	9 bytes	Query only. Used to query the unit 9-digit serial number. Unit returns its S/N in the form xxxxxxxxx. **Example:** SNO=176500143	SNO? SNO* SNO#	SNO?	SNO=xxxxxxxxx
Software Revision	N/A	5 bytes	Query only. Unit returns the value of the internal software revision installed in the unit, in the form Boot:X.X.X Bulk1:Y.Y.Y Bulk2: Z.Z.Z. **Example:** SWR=Boot:1.0.3 Bulk1:1.0.1 Bulk2:1.0.0	SWR? SWR* SWR#	SWR?	SWR=Boot:X.X.X Bulk1:Y.Y.Y Bulk2:Z.Z.Z

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Retrieve next 5 unread Stored Events	N/A	75 bytes	Query only. Unit returns the oldest 5 Stored Events which have not yet been read over the remote control in the form {CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body, where Sub-body= ABCddmmyyhhmmss is as follows: A being the fault/clear indicator. F=Fault C=Clear I=Info B being the fault type where: 1=Unit 2=Rx Traffic 3=Tx Traffic 4=Log C is Fault Code numbers, as in FLT? or Info Code, which is: 0=Power Off 1=Power On 2=Log Cleared 3=Global Config Change 4=Redundancy Config Change If there are less than 5 events to be retrieved, the remaining positions are padded with zeros. If there are no new events, the response is RNE*.	RNE? RNE* RNE#	RNE?	RNE={CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss
Tx ASI Bandwidth	TAB=	2 bytes	Command or Query. Tx ASI Bandwidth in the form sx, where: s=Defines which interface slot (1 or 2) x=Defines ASI Bandwidth, where: 0=Wide 1=Narrow **Example:** TAB=11 (Narrow bandwidth selected)	TAB= TAB? TAB* TAB#	TAB?s	TAB=sx
Tx Alpha Rolloff	TAR=	1 byte	Command or Query. Tx Alpha Rolloff in the form x, where: 0 = 20% 1 = 25% 2 = 35% **Example:** TAR=0 (Tx Alpha Rolloff of 20% selected)	TAR= TAR? TAR* TAR#	TAR?	TAR=x
Tx Clock Invert	TCI=	2 bytes	Command or Query. Invert Transmit Clock, where: s=Defines which interface slot (1 or 2) x=Invert Transmit Clock, where: 0=Normal 1=Inverted **Note:** Command valid Only with HSSI) **Example:** TCI = 11 (Inverted TX Clock, Slot 1 selected)	TCI = TCI? TCI * TCI #	TCI?s	TCI =sx (See Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Data Invert	TDI=	2 bytes	Command or Query. Invert Transmit Data, where: s=Defines which interface slot (1 or 2) x=Invert Transmit Data, where: 0=Normal 1=Inverted **Note:** Command valid Only with HSSI **Example:** TDI = 111 (Inverted TX Data selected)	TDI = TDI? TDI * TDI #	TDI?sc	TDI =sx (See Description of Arguments)
Tx Data Rate	N/A	10 bytes	Query only. Composite Tx Data rate, in kbps, in the form xxxxxx.xxx. Resolution=1 bps. **Example:** TDR=002047.999 (2047.999 kbps indicated)	TDR? TDR* TDR#	TDR?	TDR=xxxxxx.xxx
Tx Frequency	TFQ=	9 bytes	Command or Query. Tx Frequency (in MHz) in the form xxxx.xxxx, where: 52 to 88 MHz, and 104 to 176 MHz (70/140 Modulator) 950 to 1950 MHz (L-Band Modulator) Resolution=100Hz. **Example:** TFQ=0950.0000	TFQ= TFQ? TFQ* TFQ#	TFQ?	TFQ=xxxx.xxxx
Tx Frame Size	TFS=	1 byte	Command or Query. Tx Frame Size Long/Short selection in the form x, where: 0=Short, 1=Long **Example:** TFS =0 (Short Frame Size selected) **Note:** Setting only valid in DVB-S2 mode.	TFS = TFS? TFS * TFS #	TFS?	TFS =x
Tx FEC Type	N/A	1 byte	Query only. Tx FEC coding type in the form x, where: 0=Viterbi + Reed-Solomon 1=LDPC FEC is dependent on the TX Mode Type. **Example:** TFT=1 (LDPC coding indicated)	TFT? TFT* TFT#	TFT?	TFT=x
Tx Gold Code Sequence Index	TGS=	6 bytes	Command or Query. Tx Gold Code Sequence Index in the form xxxxxx, where: xxxxxx = Gold Code Sequence index (0 to 262141) **Example:** TGS=189063 **Note:** Valid only in DVB-S2 mode.	TGS= TGS? TGS* TGS#	TGS?	TGS=xxxxxx

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Interface Enable	TIE=	2 bytes	Command or Query. Interface Slot Enable/Disable in the form sx, where: s=Defines which interface slot (1 or 2) x=Tx Interface Status, where: 0=Disabled 1=Enabled **Example:** TIE =11 (Transmit interface enabled)	TIE= TIE? TIE* TIE#	TIE?s	TIE=sx
Real-time Clock Time	TIM=	6 bytes	Command or Query. A time as indicated from midnight, in the form hhmmss, where: hh = hours (00 to 23) mm = minutes (00 to 59) ss = seconds (00 to 59) **Example:** TIM=231259 (23 hours:12 minutes:59 seconds)	TIM= TIM? TIM* TIM#	TIM?	TIM=hhmmss
Tx Interface Port	TIP=	2 bytes	Command or Query. Indicates which port on the interface is to be used (ASI card only) in the form sp, where: s = interface slot (1 to 2) p = interface port/channel (1 to 4) 1 = J4 2 = J5 **Example:** TIP=11 (Port J4 on Interface Slot 1 selected)	TIP= TIP? TIP* TIP#	TIP?s	TIP=sp
Tx Location of the Pilot	TLP=	1 byte	Command or Query. Tx Pilot On/Off selection in the form x, where: 0=Average, 1=Peak **Example:** TLP=0 (Pilot Average selected) **Note:** Valid only in DVB-S2 mode.	TLP= TLP? TLP* TLP#	TLP?	TLP=x
Temperature	N/A	3 bytes	Query only. Unit returns the value of the internal temperature, in degrees C, the form sxxx, where: s=sign (+ or -) xxx=number of degrees. **Example:** TMP=+026	TMP? TMP* TMP#	TMP?	TMP=sxxx
Tx Pilot On/Off	TPI=	1 byte	Command or Query. Tx Pilot On/Off selection in the form x, where: 0=Off, 1=On **Example:** TPI=0 (Pilot Off selected) **Note:** Valid only in DVB-S2 mode.	TPI= TPI? TPI* TPI#	TPI?	TPI=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Power Level	TPL=	5 bytes	Command or Query. Tx Output power level in the form sxx.x, where: s=sign (+ / -) xx.x = Tx Output power level, +05.0 and –20.0 dBm. L-Band: -25.0 to –05.0 dBm 70/140 MHz: -20.0 to +00.0 dBm **Note:** Beyond –20 dBm is beyond the specification. **Example:** TPL = -13.4	TPL= TPL? TPL* TPL#	TPL?	TPL=sxx.x
Test Pattern	TPT=	1 byte	Command or Query. Set Test Pattern in the form x, where: 0=Off 1=2047 2=2^23-1 **Example:** TPT=1 (2047)	TPT= TPT? TPT * TPT #	TPT?	TPT=x
Transmit & Receive Configuration	TRC=	69 bytes	Command or Query. Global configuration, in the form: aaa.aaaabcc.ccccccdefghhhhhhiii.ijkllll.llllmnn.nnnnnnopqrssssssstuvv, where: aaaa.aaaa = Tx Frequency (in MHz) same as TFQ b = Tx Mode same as TMM cc.cccccc = Tx Symbol Rate same as TSR d = Tx FEC Type same as TFT ** e = Tx Modulation type same as TMD f = Tx FEC Rate same as TCR g = Tx Spectrum Inversion same as TSI hhhhhh = Tx Gold Code Sequence same as TGS iii.i = Tx Power Level same as TPL j = Tx Carrier State same as TXO k = Tx Alpha Roll-off same as TAR llll.llll = Rx Frequency (in MHz) same as RFQ m = Rx Mode same as RMM nn.nnnnnn = Rx Symbol Rate same as RSR o = Rx FEC Type same as RFT ** p = Rx Modulation type same as RMD q = Rx FEC Rate same as RCR x = spare ssssss = Rx Gold Code Sequence same as RGS t = Rx Alpha Roll-off same as RAR u = Unit test Mode same as TST** vv = Unit Alarm Mask same as MSK ** Read-only	TRC= TRC? TRC* TRC#	TRC?	TRC= aaaa.aaaabcc.ccccccdefghhhhhhiii.ijkllll.llllmnn.nnnnnnopqxssssssstuvv Returns current transmit and receive configuration. **Notes:** 1. Unit returns ‘x’s for Rx parameters if unit is modulator only. 2. Unit returns ‘x’s for Tx parameters if unit is demodulator only. 3. If Rx is in DVB-S2 mode, the Rx Modulation Type and Rx FEC Rate is ignored because these are automatically detected.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Spectrum Invert	TSI=	1 byte	Command or Query. Tx Spectrum Invert selection in the form x, where: 0=Normal 1=Tx Spectrum Inverted **Example:** TSI=0 (normal SI selected)	TSI= TSI? TSI* TSI#	TSI?	TSI=x
Unit Test Mode	TST=	1 byte	Command or Query. Test Mode in the form x, where: 0=Normal Mode (no test) 1=IF Loop 2=I/O Loop 3=RF Loop 4=Tx CW 5=Tx Alternating 1,0 Pattern **Example:** TST=4 (Tx CW)	TST= TST? TST* TST#	TST?	TST=x
Tx Transport Mode	TTM=	1 byte	Command or Query. Sets the transport mode for DVB-S2 mode. 0 = Generic Mode 1 = Transport Stream (Default) **Note:** Command applies only with DVB-S2 and HSSI. For any other mode, set TTM to 1 **Example:** TTM=1 (Transport Mode selected)	TTM= TTM? TTM* TTM#	TTM?	TTM=x
Tx Carrier State	TXO=	1 byte	Command or Query. Tx Carrier State in the form x, where: 0=OFF due to front panel or remote control command 1=ON **Example:** TXO=1 (Tx Carrier ON)	TXO= TXO? TXO* TXO#	TXO?	TXO=x

A.6.2 Demodulator

Priority System = RMM (Highest priority), RMD, RCR, and RSR (Lowest Priority) , as indicated by **shading** . Any change to a higher priority parameter can override any of the parameters of lower priority.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Mode	RMM=	1 byte	Command or Query. Rx Mode in the form x, where: 0=DVB-S 1=DVB-S2 2=DVB-DSNG **Example:** RMM=0 (DVB-S mode selected) **Note:** Refer to **Sect. 1.5 Summary of Specifications** for available code rates, modulation types, and symbol rates for each mode.	RMM= RMM? RMM* RMM#	RMM?	RMM=x
Rx Modulation Type	RMD=	1 byte	Command or Query. Rx Modulation type in the form x, where: 0=QPSK 1=8PSK 2=16QAM 3=16APSK 4=32APSK **Example:** RMD=1 (8PSK selected) **Note:** Refer to **Sect. 1.5 Summary of Specifications** for available modulation types for each mode. If the demodulator is set to DVB-S2 mode, this command is query-only because the demodulation type is automatically detected, but if the unit is not locked, the query returns 'x'.	RMD= RMD? RMD* RMD#	RMD?	RMD=x
Rx FEC Code Rate	RCR=	1 byte	Command or Query. Rx Code Rate in the form x, where: 0 = Rate 3/4 1 = Rate 7/8 2 = Rate 3/5 3 = Rate 4/5 4 = Rate 5/6 5 = Rate 8/9 6 = Rate 9/10 7 = Rate 2/3 8 = Rate 1/2 **Example:** RCR=0 (Rate 3/4 selected) **Note:** Refer to **Sect. 1.5 Summary of Specifications** for a list of available code rates for each mode. If the demodulator is set to DVB-S2 mode, this command is query-only because the code rate is automatically detected, but if the unit is not locked, the query returns 'x'.	RCR= RCR? RCR* RCR#	RCR?	RCR=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Symbol Rate	RSR=	9 bytes	Command or Query. Rx Symbol Rate in the form x, where: s=Symbol Rate in Msps **Example:** RSR=20.000000 (20 Msps.) **Note:** Refer to **Sect. 1.5 Summary of Specifications** for available symbol rates for each mode.	RSR= RSR? RSR* RSR#	RSR?	RSR=ss.ssssss
Enable/ Disable Adaptive Equalizer	AEQ=	1 byte	Command or Query. Adaptive Equalizer status in the form x, where: 0=Disable 1=Enable **Example:** AEQ=1 (Adaptive Equalizer enabled)	AEQ= AEQ? AEQ* AEQ#	AEQ?	AEQ=x
ASI Rx Frame Size	ARF=	2 bytes	Command or Query. (CDI-40 ASI module only) Indicates whether the ASI Rx Frame Size is 188 or 204 bytes, in the form sf, where: s = interface slot (1 or 2) f = frame size 0 = 188 bytes 1 = 204 bytes **Example:** ARF=11 (Interface Slot 1 set to 204 byte frame size)	ARF= ARF? ARF* ARF#	ARF?s	ARF=sf
Auto Switch Mode	ASW=	1 byte	Command or Query. Unit returns the redundancy auto/manual mode of the unit in the form x, where: 0 = Manual 1 = Automatic **Example:** ASW=0 (Manual Mode selected)	ASW= ASW? ASW* ASW#	ASW?	ASW=x (See Description of Arguments)
Rx BER	N/A	7 bytes	Query only. Units returns the value of the estimated BER in the form ab x 10^{-c} . First three bytes are the value. Last two bytes are the exponent. Returns 0.0E+00 if the demodulator is unlocked. **Example:** BER=4.8E-03 (BER = 4.8 x 10^{-3} is specified)	BER? BER* BER#	BER?	BER=a.bEscc
Clear All Stored Events	CAE=	None	Command only. Forces the software to clear the software events log. **Example:** CAE= **Note:** This command takes no arguments	CAE= CAE? CAE* CAE#	N/A	N/A
Circuit ID String	CID=	24 bytes	Command or Query. Sets or queries the user-defined Circuit ID string, which is a fixed length of 24 characters. Valid characters include: Space ( ) * + – , . / 0 9 and A thru Z	CID= CID? CID* CID#	CID?	CID=xxxxxxxxxxxxxxxxxxxxxxxx
Configuration Load	CLD=	1 byte	Command Only Retrieves a previously stored configuration from the specified configuration location (0 to 9). **Example:** CLD=4 (retrieve configuration from Location 4)	CLD= CLD? CLD* CLD#	N/A	N/A

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Configuration Save	CST=	1 byte	Command only. Stores the current configuration in the specified configuration location (0 to 9). **Example:** CST=4 (store the current configuration in Location 4)	CST= CST? CST* CST#	N/A	N/A
Real-time Clock Date	DAY=	6 bytes	Command or Query. A date in the form ddmmyy, where: dd = day of the month (01 to 31), mm = month (01 to 12) yy = year (00 to 99) **Example:** DAY=240457 (April 24, 2057)	DAY= DAY? DAY* DAY#	DAY?	DAY=ddmmyy
Demodulator Lock Status	N/A	1 byte	Query only. Demodulator Lock Status in the form x, where: 0 = Demodulator Unlocked 1 = Demodulator Locked **Example:** DLK=1 (Demodulator Locked)	DLK? DLK* DLK#	DLK?	DLK=x
Eb/No Alarm Point	EBA=	4 bytes	Command or Query. Eb/No alarm point in dB, with a range between 0.1 and 16 dB. Resolution=0.1 dB **Example:** EBA=12.3	EBA= EBA? EBA* EBA#	EBA?	EBA=xx.x (See Description of Arguments)
Rx Eb/No	N/A	4 bytes	Query only. Unit returns the value of Eb/No (when in DVB-S or DVB-DSNG mode), between 0 and 16 dB, resolution 0.1 dB. Returns 99.9 if demod is unlocked. **Example:** EBN=12.3 (Eb/No specified = 12.3 dB) For values greater than 16.0 dB, the reply will be: **EBN=+016**	EBN? EBN* EBN#	EBN?	EBN=xxxx
External Reference Frequency	ERF=	1 byte	Command or Query. External Reference Frequency in the form x, where: 0=Internal 1=External 1 MHz 2=External 2 MHz 3=External 5 MHz 4=External 10 MHz 5=External 20 MHz **Example:** ERF=0 (Internal selected - External reference not used)	ERF= ERF? ERF* ERF#	ERF?	ERF=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Equipment ID	N/A	23 bytes	Query only. Unit returns equipment identification and configuration, where: **aaa = defines the modulator model number (710)** **b = Modulator configuration**: 1=70/140 Mhz, 2=L-Band **c = Tx Symbol Rate S/W option:** 0 = 15.0 Msps, 1 = 22.5 Msps, 2 = 30.0 Msps, 3 = 37.5 Msps (S1 and DSNG only), 4 = 45.0 Msps (S1 and DSNG only) **d = S/W option Tx 8PSK:** 0=Not installed, 1=Installed **e = S/W option Tx 16-QAM:** 0=Not installed, 1=Installed **f = S/W option Tx 16APSK:** 0=Not installed, 1=Installed **g = S/W option Tx 32APSK:** 0=Not installed, 1=Installed **h = S/W option Tx DVB-S1:** 0=Not installed, 1=Installed **i = S/W option Tx DVB-DSNG:** 0=Not installed, 1=Installed **j = S/W option Tx DVB-S2:** 0=Not installed, 1=Installed **k = Demodulator configuration:** 0=None, 1=70/140 Mhz, 2=L-Band **l = Rx Symbol Rate S/W option:** 0=15.0 Msps, 1 = 22.5 Msps, 2 = 30.0 Msps, 3 = 37.5 Msps (S1 & DSNG only), 4 = 45.0 Msps (S1 & DSNG only) **m = S/W option Rx 8PSK:** 0=Not installed, 1=Installed **n = S/W option Rx 16-QAM:** 0=Not installed, 1=Installed **o = S/W option Rx 16APSK:** 0=Not installed, 1=Installed **p = S/W option Rx 32APSK:** 0=Not installed, 1=Installed **q = S/W option Rx DVB-S1:** 0=Not installed, 1=Installed **r = S/W option Rx DVB-DSNG:**0=Not installed, 1=Installed **s = S/W option Rx DVB-S2:** 0=Not installed, 1=Installed **t = Interface slot #1:** 0 = None, 1 = ASI, 2 = Gigabit Ethernet Interface, 3 = HSSI **u = Interface slot #2:** 0 = None, 1 = ASI, 2 = Gigabit Ethernet Interface, 3 = HSSI	EID? EID* EID#	EID?	EID= aaabcdefghijklmnopqrstu **Notes:** 1. Unit returns 'Not Installed' for Rx options if unit is modulator only. 2. Unit returns 'Not Installed' for Tx options if unit is demodulator only.
Rx Es/No	N/A	4 bytes	Query only. Unit returns the value of EsNo (when in DVB-S2 mode), between 0 and 16 dB, resolution 0.1 dB. Returns 99.9 if demod is unlocked. **Example:** ESN=12.3 (Es/No specified is 12.3 dB) For values greater than 22.0 dB, the reply will be: **ESN=+022**	ESN? ESN* ESN#	ESN?	ESN=xxxx
Enable Redundancy Switch Mode	ESW=	1 byte, value of 0 or 1	Command or Query. Set redundancy mode in the form x, where : 0 = Disable 1 = Enable **Example:** ESW=1 (Redundancy Mode enabled)	ESW= ESW? ESW* ESW#	ESW?	ESW=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Faults and Status	N/A	5 bytes	Query only. Unit returns the current fault and status codes for the Unit (hardware), Tx Traffic and Rx Traffic, in the form abcd, where: a = Unit Faults: 0=No faults 1=Framer FPGA Load 2=Power supply fault, +1.5 Volts, Framer Card 3=Power supply fault, +1.5 Volts, Interface #1 4=Power supply fault, +1.5 Volts, Interface #2 5=Power supply fault, +3.3 Volts, Framer Card 6=Power supply fault, +5.0 Volts, Framer Card 7=Power supply fault, +12.0 Volts, Framer Card 8=Power supply fault, -12.0 Volts, Framer Card 9=Power supply faulit, +18.0 Volts, Framer Card A=FLASH Checksum B=FEC1 Load C=FEC2 Load D=Interface #1 Load E=Interface #2 Load F=192 MHz PLL G=External Reference H=Framer Card Temperature I=Modem Temperature J=Cooling Fans K=Interface #1 Removed L=Interface #2 Removed b = Tx Traffic Status: 0=No faults c=Rx Traffic Status 0=No faults 1=+1.5V Demod Power Supply Unit (Demodulator Card) 2=FPGA Load (Demodulator Card) 3=Demod Unlocked 4=DSNG Sync Error 5=FPGA Temperature (Demodulator Card) 6=Reserved 7=AGC Level Out of Range 8=Eb/No Limit Exceeded 9=Demodulator Synth 1 PLL A=Demodulator Synth 2 PLL B= SERDES Demod to Framer C= SERDES Framer to FEC1 D= SERDES Framer to FEC2 E=Reserved F= MPEG transport stream error.	FLT? FLT* FLT#	FLT?	FLT=abcd d=Change in fault status since last poll. **Note:** Each section has faults listed in order of priority. For each section, only the highest priority fault is returned. There maybe multiple faults for each section, but only the highest fault is returned.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
			G=ASI Rx PLL Empty (Interface 1) H=ASI Rx PLL Full (Interface 1) I=ASI Rx PLL Lower Limit Reached (Interface 1) J=ASI Rx PLL Upper Limit Reached (Interface 1) K=Reserved L=Reserved M=Reserved N=Reserved O=Reserved P=ASI Rx SERDES Error (Interface 1) Q=ASI Rx SERDES DCM Unlocked (Interface 1) R= Reserved S= Reserved T=HSSI Rx Buffer Underrun (Interface 1) U=HSSI Rx Buffer Overflow (Interface 1) V=Reserved W=Reserved X=Framer SERDES Rx Fault (Interface 1) Y=Framer SERDES Rx Fault (Interface 2) Z=Reserved [=Reserved d=New Faults 0=No new faults 1=New faults since last check			
Firmware Revisions	N/A	1 byte	Query only. Query the version information of the system, where: i = Bulk Image number (1 or 2) a = Firmware Image b = Firmware Revision c = Firmware Date **Example:** FRW?1	FRW? FRW* FRW#	FRW?i	FRW={CR}Boot:{CR}a,b,c{CR} Bulki:{CR}a,b,c{CR}a,b,c…
Gigabit Egress FEC Enable	GEF=	2 bytes	Command or Query. Gigabit Egress FEC Enable/Disable in the form sn, where: s=Slot (1, 2) n=Enable / Disable, where 0 = Disabled 1 = Enabled	GEF= GEF# GEF? GEF*	GEF?s	GEF=sn
Gigabit Egress Multicast Group Address	GEG=	16 bytes	Command or Query. Gigabit Egress Multicast Group Address. The multicast stream egressing from the gigabit interface will have this IP address as the source IP address in the form siii.iii.iii.iii, where: s=Slot (1, 2) i=IP Address	GEG= GEG# GEG? GEG*	GEG?s	GEG=siii.iii.iii.iii

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Gigabit Egress Port Numbers	GEP=	11 bytes	Command or Query. Gigabit Egress Port Numbers in the form snnnnnppppp, where: s=Slot (1, 2) nnnnn = Source Port Number (0 – 65535) ppppp = Destination Port Number (0 – 65535) **Note:** Both Source Port and Destination Port must be valid for set command to take effect.	GEP= GEP# GEP? GEP*	GEP?s	GEP=snnnnnppppp
Gigabit Egress FEC Matrix	GFM=	6 bytes	Command or Query. Gigabit Egress FEC Matrix in the form sll,dd where: s=Slot (1, 2) ll = Length, two digit number (leading zero) between 1 and 20. dd = Depth, two digit number (leading zero) between 4 and 20. **Note:** Length x Depth, must be less than or equal to 100)	GFM= GFM # GFM? GFM*	GFM?s	GFM=sll,dd
Gigabit Management IP Address and Subnet	GIP=	19 bytes	Command or Query. Gigabit Management IP address and subnet mask in the form siii.iii.iii.iii.nn, where: s=Slot (1, 2) i=IP Address n=Netmask	GIP= GIP# GIP? GIP*	GIP?s	GIP=siii.iii.iii.iii.nn
Initialize Events Pointer	IEP=	None	Command only. Resets internal pointer to allow RNE? queries to start at the beginning of the stored events log.	IEP= IEP? IEP* IEP#	N/A	N/A
Boot Image	IMG=	1 byte	Command only. Boot image selection, where n is the image number in the form n, where: 1=Image #1 2=Image #2 **Example:** IMG=1 (Image #1 selected for booting.)	IMG= IMG? IMG* IMG#	IMG?	IMG=n
IP Address	IPA=	18 bytes	Command or Query. Used to set the IP address and network prefix for the 10/100 BaseTx Ethernet management port, in the form xxx.xxx.xxx.xxx.yy, where: xxx.xxx.xxx.xxx is the IP address yy is the network prefix (00..31) **Example:** IPA=010.006.030.001.24	IPA= IPA? IPA* IPA#	IPA?	IPA= xxx.xxx.xxx.xxx.yy
Gateway Address	IPG=	15 bytes	Command or Query. Used to set the Gateway IP addess for the 10/100 Base Tx Ethernet management port, in the form xxx.xxx.xxx.xxx, where: xxx.xxx.xxx.xxx is the IP address **Example:** IPG = 010.006.030.001	IPG= IPG? IPG* IPG#	IPG?	IPG = xxx.xxx.xxx.xxx

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Interface Type	N/A	2 bytes	Query only. Interface Type in the form sx, where: s=Defines which interface slot (1 or 2) x=Defines the interface type, where: 0=ASI 1=Gigabit Ethernet 2=HSSI **Example:** ITF?1	ITF? ITF* ITF#	ITF?s	ITF=sx
Rx Link Margin	N/A	4 bytes	Query only. Unit returns the value of the Link Margin. Returns 00.0 if demod is unlocked. **Example:** LNK=12.3	LNK? LNK* LNK#	LNK?	LNK=xxxx
Local/Remote Status	LRS=	1 byte	Command or Query. Local/Remote status in the form x, where: 0=Local 1=Serial 2=Reserved 3=Ethernet 4=Serial+Ethernet **Example:** LRS=1 (Serial Remote selected)	LRS= LRS? LRS* LRS#	LRS?	LRS=x
Unit MAC Address	N/A	12 bytes	Query only. MAC address of the unit, reported in hexadecimal. **Example:** MAC=0006B000D2A7 (The MAC address of the unit is 00:06:B0:00:D2:A7)	MAC? MAC* MAC#	MAC?	MAC=AABBCCDDEEFF
Unit Alarm Mask	MSK=	2 bytes	Command or Query. Alarm mask conditions, in the form ab, where: a=Tx AIS (0 = Alarm, 1 =Fault, 2 = Masked) b=Spare **Example:** MSK = 00	MSK= MSK? MSK* MSK#	MSK?	MSK=ab
Number of Unread stored Events	N/A	3 bytes	Query only. Unit returns the Number of Unread Events, which remain stored, in the form xxx. **Note:** This means unread over the remote control. **Example:** NUE=126	NUE? NUE* NUE#	NUE?	NUE=xxx
Rx PER	N/A	7 bytes	Query only. Units returns the value of the estimated PER in the form a.bEscc, representing **ab x 10^{-c}**. First three bytes are the value; last two bytes are the exponent. Returns 0.0E+00 if the demodulator is unlocked. **Example:** PER=4.8E-03 (PER is 4.8 x 10^{-3})	PER? PER* PER#	PER?	PER=a.bEscc
Rx Alpha Rolloff	RAR=	1 byte	Command or Query. Rx Alpha Rolloff in the form x, where: 0 = 20% 1 = 25% 2 = 35% **Example:** RAR=0 (Rx Alpha Rolloff of 20% selected)	RAR= RAR? RAR* RAR#	RAR?	RAR=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Buffer Size	RBS=	5 bytes	Command or Query. Rx Buffer Size (in milliseconds) in the form sxx.x, where: s=Defines which interface slot (1 or 2) xx.x= Rx Buffer Size, HSSI = 5.0 to 32.0 ms, in 0.1 ms steps GBEI = N/A ASI = N/A **Example:** RBS=130.0 (selects 30.0 ms on interface 1)	RBS= RBS? RBS* RBS#	RBS?s	RBS=sxx.x (See Description of Arguments)
Soft Reboot	RBT=1	1 byte	Command only. Soft Reboot. 1= Reboot System	RBT? RBT* RBT#	N/A	RBT=
Rx Clock Invert	RCI=	2 bytes	Command or Query. Invert Receive Clock in the form sx, where: s=Defines which interface slot (1 or 2) x=Invert Receive Clock, where: 0=Normal 1=Inverted **Note:** Command valid Only with HSSI **Example:** RCI = 11 (Inverted RX Clock, Slot 1 selected)	RCI = RCI? RCI * RCI #	RCI?s	RCI =sx (See Description of Arguments)
Rx Clock Source	RCK=	2 bytes	Command or Query. Rx Clock Source (for data rate accuracy) in the form sx, where: s=Defines which interface slot (1 or 2) x=Rx Clock Source, where: 0=Rx Satellite 1=Tx-Terrestrial 2=External Reference Clock 3=Internal (HSSI Only) **Example:** RCK=11 (Tx-Terrestrial selected)	RCK= RCK? RCK* RCK#	RCK?s	RCK=sx (See Description of Arguments)
Rx Data Invert	RDI=	2 bytes	Command or Query. Invert Receive Data in the form sx, where: s=Defines which interface slot (1 or 2) x=Invert Receive Data, where: 0=Normal 1=Inverted **Note:** Command valid Only with HSSI. **Example:** RDI = 11 (Inverted RX Data selected)	RDI = RDI? RDI* RDI#	RDI?sc	RDI =sx (See Description of Arguments)
Rx Data Rate	N/A	10 bytes	Query only. Composite Rx Data rate, in kbps, in the form xxxxxx.xxx. Resolution=1 bps. **Example:** RDR=002047.999 (2047.999 kbps specified)	RDR? RDR* RDR#	RDR?	RDR=xxxxxx.xxx

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Redundancy State	RED=	1 byte	Command or Query. Unit returns the redundancy state of the unit in the form x, where: 0 = Offline 1 = Online **Notes:** 1. This command can be used to force the unit offline, this is done by sending RED=0. This is only valid if redundancy mode is enabled – if redundancy is not enabled, then RED=0 will return an error. The unit cannot be forced online. 2. If the unit is not in redundancy mode, then the unit will always be online. **Example:** RED=0 (force unit offline)	RED= RED? RED* RED#	RED?	RED=x (See Description of Arguments)
Rx Frequency Offset	N/A	5 bytes	Query only. Unit returns the value of the measured frequency offset of the carrier being demodulated in the form sxxx.x. Values range from ± 0 to ± 100 kHz, 100 Hz resolution. Returns 999999 if the demodulator is unlocked. **Example:** RFO=+002.3 (which is + 2.3 kHz)	RFO? RFO* RFO#	RFO?	RFO=sxxx.x
Rx Frequency	RFQ=	9 bytes	Command or Query. Rx Frequency (in MHz) in the form xxxx.xxxx: 52 to 88 MHz, and 104 to 176 MHz (70/140 Modulator) 950 to 1950 MHz (L-Band Modulator) Resolution=100Hz. **Example:** RFQ=0950.0000	RFQ= RFQ? RFQ* RFQ#	RFQ?	RFQ=xxxx.xxxx
Rx Frame Size	N/A	1 byte	Query only. Rx Frame Size Long/Short selection in the form x, where: 0=Short, 1=Long **Example:** RFS =0 (which is Short Frame Size) **Note:** Valid only in DVB-S2 mode. If the unit is not locked, the query returns 'x'.	RFS? RFS * RFS #	RFS?	RFS =x
Rx FEC Type	N/A	1 byte	Query only. Rx FEC coding type in the form x, where: 0=Viterbi + Reed-Solomon 1=LDPC **Note:** FEC is dependent on the RX Mode Type. **Example:** RFT=1 (which is LDPC coding)	RFT? RFT* RFT#	RFT?	RFT=x
Rx Gold Code Sequence Index	RGS=	6 bytes	Command or Query. Rx Gold Code Sequence Index: xxxxxx = Gold Code Sequence index (0 to 262141) **Example:** RGS=189063 **Note:** Valid only in DVB-S2 mode.	RGS= RGS? RGS* RGS#	RGS?	RGS=xxxxxx

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Interface Enable	RIE=	2 bytes	Command or Query. Interface Slot Enable/Disable in the form sx, where: s=Defines which interface slot (1 or 2) x=Rx Interface Status, where: 0=Disabled 1=Enabled **Example:** RIE =11 (Slot 1 Rx interface enabled)	RIE= RIE? RIE* RIE#	RIE?s	RIE=sx
Retrieve next 5 unread Stored Events	N/A	75 bytes	Query only. Unit returns the oldest 5 Stored Events which have not yet been read over the remote control in the form {CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body, where Sub-body= ABCddmmyyhhmmss is as follows: A being the fault/clear indicator. F=Fault C=Clear I=Info B being the fault type where: 1=Unit 2=Rx Traffic 3=Tx Traffic 4=Log C is Fault Code numbers, as in FLT? or Info Code, which is: 0=Power Off 1=Power On 2=Log Cleared 3=Global Config Change 4=Redundancy Config Change If there are less than 5 events to be retrieved, the remaining positions are padded with zeros. If there are no new events, the response is RNE*.	RNE? RNE* RNE#	RNE?	RNE={CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss
Rx Pilot On/Off	N/A	1 byte	Command or Query. Rx Pilot On/Off selection in the form x, where: 0=Off, 1=On **Example:** RPI=0 (Pilot Off selected) **Note:** Valid only in DVB-S2 mode. This is automatically detected on demod acquisition, but if the unit is not locked, the query returns 'x'.	RPI= RPI? RPI* RPI#	RPI?	RPI=x
Rx Signal Level	N/A	3 bytes	Query only. Unit returns the value of the Rx signal level, in dBm, between +3.0 and –99.0 dBm, in the form xxx where; xxx is the Rx signal level. **Examples:** RSL=+03 RSL=-41	RSL? RSL* RSL#	RSL?	RSL=xxx

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Demod Acquisition Sweep Width	RSW=	3 bytes	Command or Query. Rx ± acquisition sweep range of demodulator, in kHz, ranging from ± 1 to ± 100 kHz in the form xxx. **Example:** RSW=009 (± 9 kHz selected)	RSW= RSW? RSW* RSW#	RSW?	RSW=xxx (See Description of Arguments)
Rx Transport Mode	N/A	1 byte	Query only. Reads the transport mode for DVB-S2 mode only in the form x, where: 0 = Generic Mode 1 = Transport Stream (Default) **Note:** Command applies only with DVB-S2 and HSSI. For any other mode, set RTM to 1. **Example:** RTM=1 (Transport Stream selected)	RTM? RTM* RTM#	RTM?	RTM=x
Serial Number	N/A	9 bytes	Query only. Used to query the unit 9-digit serial number. Unit returns its S/N in the form xxxxxxxxx. **Example:** SNO=176500143	SNO? SNO* SNO#	SNO?	SNO=xxxxxxxxx
Software Revision	N/A	5 bytes	Query only. Unit returns the value of the internal software revision installed in the unit, in the form Boot:X.X.X Bulk1:Y.Y.Y Bulk2: Z.Z.Z. **Example:** SWR=Boot:1.0.3 Bulk1:1.0.1 Bulk2:1.0.0	SWR? SWR* SWR#	SWR?	SWR=Boot:X.X.X Bulk1:Y.Y.Y Bulk2:Z.Z.Z
Real-time Clock Time	TIM=	6 bytes	Command or Query. A time as indicated from midnight, in the form hhmmss, where: hh = hours (00 to 23) mm = minutes (00 to 59) ss = seconds (00 to 59) **Example:** TIM=231259 (23 hours: 12 minutes: 59 seconds)	TIM= TIM? TIM* TIM#	TIM?	TIM=hhmmss
Temperature	N/A	3 bytes	Query only. Unit returns the value of the internal temperature, in degrees C, in the form sxxx, where: s=sign (+ or -) xxx=number of degrees. **Example:** TMP=+026	TMP? TMP* TMP#	TMP?	TMP=sxxx

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Transmit & Receive Configuration	TRC=	69 bytes	Command or Query. Global configuration, in the form: aaa.aaaabcc.ccccccdefghhhhhhiii.ijkllll.llllmnn.nnnnnnopqrssssssstuvv, where: aaaa.aaaa = Tx Frequency (in MHz) same as TFQ b = Tx Mode same as TMM cc.cccccc = Tx Symbol Rate same as TSR d = Tx FEC Type same as TFT ** e = Tx Modulation type same as TMD f = Tx FEC Rate same as TCR g = Tx Spectrum Inversion same as TSI hhhhhh = Tx Gold Code Sequence same as TGS iii.i = Tx Power Level same as TPL j = Tx Carrier State same as TXO k = Tx Alpha Roll-off same as TAR llll.llll = Rx Frequency (in MHz) same as RFQ m = Rx Mode same as RMM nn.nnnnnn = Rx Symbol Rate same as RSR o = Rx FEC Type same as RFT ** p = Rx Modulation type same as RMD q = Rx FEC Rate same as RCR x = spare ssssss = Rx Gold Code Sequence same as RGS t = Rx Alpha Roll-off same as RAR u = Unit test Mode same as TST** vv = Unit Alarm Mask same as MSK ** Read-only	TRC= TRC? TRC* TRC#	TRC?	TRC= aaaa.aaaabcc.ccccccdefghhhhhhiii.ijkllll.llllmnn.nnnnnnopqxssssssstuvv Returns current transmit and receive configuration. **Notes:** 1. Unit returns ‘x’s for Rx parameters if unit is modulator only. 2. Unit returns ‘x’s for Tx parameters if unit is demodulator only. 3. If Rx is in DVB-S2 mode, the Rx Modulation Type and Rx FEC Rate is ignored because these are automatically detected.

A.6.3 Modem

Priority System = (Highest priority) TMM, TMD, TCR, and TSR (Lowest Priority) , as indicated by **shading**. Any change to a higher priority parameter can override any of the parameters of lower priority.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Mode	TMM=	1 byte	Command or Query. Tx Mode, where: 0=DVB-S 1=DVB-S2 2=DVB-DSNG **Example:** TMM=0 (DVB-S mode selected) **Note:** Refer to **Sect. 1.5 Summary of Specifications** for available code rates, modulation types, and symbol rates for each mode.	TMM= TMM? TMM* TMM#	TMM?	TMM=x
Tx Modulation Type	TMD=	1 byte	Command or Query. Tx Modulation type, where: 0=QPSK 1=8PSK 2=16QAM 3=16APSK 4=32APSK **Example:** TMD=1 (8PSK selected) **Note:** Refer to **Sect. 1.5 Summary of Specifications** for available modulation types for each mode.	TMD= TMD? TMD* TMD#	TMD?	TMD=x
Tx FEC Code Rate	TCR=	1 byte	Command or Query. Tx Code Rate, where: 0 = Rate 3/4 1 = Rate 7/8 2 = Rate 3/5 3 = Rate 4/5 4 = Rate 5/6 5 = Rate 8/9 6 = Rate 9/10 7 = Rate 2/3 8 = Rate 1/2 Depending on FEC type, not all of these selections will be valid. **Example:** TCR=0 (Rate 3/4 selected) **Note:** Refer to **Sect. 1.5 Summary of Specifications** for a list of available code rates for each mode.	TCR= TCR? TCR* TCR#	TCR?	TCR=x
Tx Symbol Rate	TSR=	9 bytes	Command or Query. Tx Symbol Rate, in the form ss.ssssss where: ss.ssssss =Symbol Rate in Msps **Example:** TSR=20.000000 (20 Msps selected)	TSR= TSR? TSR* TSR#	TSR?	TSR=ss.ssssss

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Auto Switch Mode	ASW=	1 byte	Command or Query. Unit returns the redundancy auto/manual mode of the unit in the form x, where: 0 = Manual 1 = Automatic **Example:** ASW=0 (Manual Mode selected)	ASW= ASW? ASW* ASW#	ASW?	ASW=x (See Description of Arguments)
Tx Output Impendance	IMP=	1 byte	Command or Query. Tx output impedance in the form x, where: 0=50 Ohm 1=75 Ohm **Example:** IMP=0 (Impedance set to 50 Ohms) **Note:** Setting Tx Impedence is only possible on 70/140 MHz units.	IMP= IMP? IMP* IMP#	IMP?	IMP=x
Tx ASI Bandwidth	TAB=	2 bytes	Command or Query. Tx ASI Bandwidth in the form sx, where: s=Defines which interface slot (1 or 2) x=Defines ASI Bandwidth, where: 0=Wide 1=Narrow **Example:** TAB=11 (Narrow bandwidth selected)	TAB= TAB? TAB* TAB#	TAB?s	TAB=sx
Tx Alpha Rolloff	TAR=	1 byte	Command or Query. Tx Alpha Rolloff in the form x, where: 0 = 20% 1 = 25% 2 = 35% **Example:** TAR=0 (Tx Alpha Rolloff of 20% selected)	TAR= TAR? TAR* TAR#	TAR?	TAR=x
Tx Clock Invert	TCI=	2 bytes	Command or Query. Invert Transmit Clock, where: s=Defines which interface slot (1 or 2) x=Invert Transmit Clock, where: 0=Normal 1=Inverted **Note:** Command valid Only with HSSI) **Example:** TCI = 11 (Inverted TX Clock, Slot 1 selected)	TCI = TCI? TCI * TCI #	TCI?s	TCI =sx (See Description of Arguments)
Tx Data Invert	TDI=	2 bytes	Command or Query. Invert Transmit Data, where: s=Defines which interface slot (1 or 2) x=Invert Transmit Data, where: 0=Normal 1=Inverted **Note:** Command valid Only with HSSI **Example:** TDI = 111 (Inverted TX Data selected)	TDI = TDI? TDI * TDI #	TDI?sc	TDI =sx (See Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Data Rate	N/A	10 bytes	Query only. Composite Tx Data rate, in kbps, in the form xxxxxx.xxx. Resolution=1 bps. **Example:** TDR=002047.999 (2047.999 kbps indicated)	TDR? TDR* TDR#	TDR?	TDR=xxxxxx.xxx
Tx Frequency	TFQ=	9 bytes	Command or Query. Tx Frequency (in MHz) in the form xxxx.xxxx, where: 52 to 88 MHz, and 104 to 176 MHz (70/140 Modulator) 950 to 1950 MHz (L-Band Modulator) Resolution=100Hz. **Example:** TFQ=0950.0000	TFQ= TFQ? TFQ* TFQ#	TFQ?	TFQ=xxxx.xxxx
Tx Frame Size	TFS=	1 byte	Command or Query. Tx Frame Size Long/Short selection in the form x, where: 0=Short, 1=Long **Example:** TFS =0 (Short Frame Size selected) **Note:** Setting only valid in DVB-S2 mode.	TFS = TFS? TFS * TFS #	TFS?	TFS =x
Tx FEC Type	N/A	1 byte	Query only. Tx FEC coding type in the form x, where: 0=Viterbi + Reed-Solomon 1=LDPC FEC is dependent on the TX Mode Type. **Example:** TFT=1 (LDPC coding indicated)	TFT? TFT* TFT#	TFT?	TFT=x
Tx Gold Code Sequence Index	TGS=	6 bytes	Command or Query. Tx Gold Code Sequence Index in the form xxxxxx, where: xxxxxx = Gold Code Sequence index (0 to 262141) **Example:** TGS=189063 **Note:** Valid only in DVB-S2 mode.	TGS= TGS? TGS* TGS#	TGS?	TGS=xxxxxx
Tx Interface Enable	TIE=	2 bytes	Command or Query. Interface Slot Enable/Disable in the form sx, where: s=Defines which interface slot (1 or 2) x=Tx Interface Status, where: 0=Disabled 1=Enabled **Example:** TIE =11 (Transmit interface enabled)	TIE= TIE? TIE* TIE#	TIE?s	TIE=sx

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Interface Port	TIP=	2 bytes	Command or Query. Indicates which port on the interface is to be used (ASI card only) in the form sp, where: s = interface slot (1 to 2) p = interface port/channel (1 to 4) 1 = J4 2 = J5 **Example:** TIP=11 (Port J4 on Interface Slot 1 selected)	TIP= TIP? TIP* TIP#	TIP?s	TIP=sp
Tx Location of the Pilot	TLP=	1 byte	Command or Query. Tx Pilot On/Off selection in the form x, where: 0=Average, 1=Peak **Example:** TLP=0 (Pilot Average selected) **Note:** Valid only in DVB-S2 mode.	TLP= TLP? TLP* TLP#	TLP?	TLP=x
Tx Pilot On/Off	TPI=	1 byte	Command or Query. Tx Pilot On/Off selection in the form x, where: 0=Off, 1=On **Example:** TPI=0 (Pilot Off selected) **Note:** Valid only in DVB-S2 mode.	TPI= TPI? TPI* TPI#	TPI?	TPI=x
Tx Power Level	TPL=	5 bytes	Command or Query. Tx Output power level in the form sxx.x, where: s=sign (+ / -) xx.x = Tx Output power level, +05.0 and –20.0 dBm. L-Band: -25.0 to –05.0 dBm 70/140 MHz: -20.0 to +00.0 dBm **Note:** Beyond –20 dBm is beyond the specification. **Example:** TPL = -13.4	TPL= TPL? TPL* TPL#	TPL?	TPL=sxx.x
Tx Spectrum Invert	TSI=	1 byte	Command or Query. Tx Spectrum Invert selection in the form x, where: 0=Normal 1=Tx Spectrum Inverted **Example:** TSI=0 (normal SI selected)	TSI= TSI? TSI* TSI#	TSI?	TSI=x
Tx Transport Mode	TTM=	1 byte	Command or Query. Sets the transport mode for DVB-S2 mode. 0 = Generic Mode 1 = Transport Stream (Default) **Note:** Command applies only with DVB-S2 and HSSI. For any other mode, set TTM to 1 **Example:** TTM=1 (Transport Mode selected)	TTM= TTM? TTM* TTM#	TTM?	TTM=x

A.6.4 Priority System

Priority System = (Highest priority) RMM, RMD, RCR, and RSR (Lowest Priority), as indicated by **shading**. Any change to a higher priority parameter can override any of the parameters of lower priority.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Mode	RMM=	1 byte	Command or Query. Rx Mode in the form x, where: 0=DVB-S 1=DVB-S2 2=DVB-DSNG **Example:** RMM=0 (DVB-S mode selected) **Note:** Refer to **Sect. 1.5 Summary of Specifications** for available code rates, modulation types, and symbol rates for each mode.	RMM= RMM? RMM* RMM#	RMM?	RMM=x
Rx Modulation Type	RMD=	1 byte	Command or Query. Rx Modulation type in the form x, where: 0=QPSK 1=8PSK 2=16QAM 3=16APSK 4=32APSK **Example:** RMD=1 (8PSK selected) **Note:** Refer to **Sect. 1.5 Summary of Specifications** for available modulation types for each mode. If the demodulator is set to DVB-S2 mode, this command is query-only because the demodulation type is automatically detected, but if the unit is not locked, the query returns 'x'.	RMD= RMD? RMD* RMD#	RMD?	RMD=x
Rx FEC Code Rate	RCR=	1 byte	Command or Query. Rx Code Rate in the form x, where: 0 = Rate 3/4 1 = Rate 7/8 2 = Rate 3/5 3 = Rate 4/5 4 = Rate 5/6 5 = Rate 8/9 6 = Rate 9/10 7 = Rate 2/3 8 = Rate 1/2 **Example:** RCR=0 (Rate 3/4 selected) **Note:** Refer to **Sect. 1.5 Summary of Specifications** for a list of available code rates for each mode. If the demodulator is set to DVB-S2 mode, this command is query-only because the code rate is automatically detected, but if the unit is not locked, the query returns 'x'.	RCR= RCR? RCR* RCR#	RCR?	RCR=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Symbol Rate	RSR=	9 bytes	Command or Query. Rx Symbol Rate in the form x, where: s=Symbol Rate in Msps **Example:** RSR=20.000000 (20 Msps.) **Note:** Refer to **Sect. 1.5 Summary of Specifications** for available symbol rates for each mode.	RSR= RSR? RSR* RSR#	RSR?	RSR=ss.ssssss
Enable/ Disable Adaptive Equalizer	AEQ=	1 byte	Command or Query. Adaptive Equalizer status in the form x, where: 0=Disable 1=Enable **Example:** AEQ=1 (Adaptive Equalizer enabled)	AEQ= AEQ? AEQ* AEQ#	AEQ?	AEQ=x
ASI Rx Frame Size	ARF=	2 bytes	Command or Query. (CDI-40 ASI module only) Indicates whether the ASI Rx Frame Size is 188 or 204 bytes, in the form sf, where: s = interface slot (1 or 2) f = frame size 0 = 188 bytes 1 = 204 bytes **Example:** ARF=11 (Interface Slot 1 set to 204 byte frame size)	ARF= ARF? ARF* ARF#	ARF?s	ARF=sf
Auto Switch Mode	ASW=	1 byte	Command or Query. Unit returns the redundancy auto/manual mode of the unit in the form x, where: 0 = Manual 1 = Automatic **Example:** ASW=0 (Manual Mode selected)	ASW= ASW? ASW* ASW#	ASW?	ASW=x (See Description of Arguments)
ASI Tx Frame Size	ATF=	2 bytes	Command or Query. (CDI-40 ASI module only) Indicates whether the ASI Tx Frame Size is 188 or 204 bytes in the form sf, where: s = interface slot (1 or 2) f = frame size 0 = 188 bytes 1 = 204 bytes **Example:** ATF=11 (Interface Slot 1 set to 204 byte frame size)	ATF= ATF? ATF* ATF#	ATF?s	ATF=sf
Rx BER	N/A	7 bytes	Query only. Units returns the value of the estimated BER in the form ab x 10^{-c} . First three bytes are the value. Last two bytes are the exponent. Returns 0.0E+00 if the demodulator is unlocked. **Example:** BER=4.8E-03 (BER = 4.8 x 10^{-3} is specified)	BER? BER* BER#	BER?	BER=a.bEscc
Clear All Stored Events	CAE=	None	Command only. Forces the software to clear the software events log. **Example:** CAE= **Note:** This command takes no arguments	CAE= CAE? CAE* CAE#	N/A	N/A

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Circuit ID String	CID=	24 bytes	Command or Query. Sets or queries the user-defined Circuit ID string, which is a fixed length of 24 characters. Valid characters include: Space ( ) * + – , . / 0 9 and A thru Z	CID= CID? CID* CID#	CID?	CID=xxxxxxxxxxxxxxxxxxxxxx
Configuration Load	CLD=	1 byte	Command Only Retrieves a previously stored configuration from the specified configuration location (0 to 9). **Example:** CLD=4 (retrieve configuration from Location 4)	CLD= CLD? CLD* CLD#	N/A	N/A
Configuration Save	CST=	1 byte	Command only. Stores the current configuration in the specified configuration location (0 to 9). **Example:** CST=4 (store the current configuration in Location 4)	CST= CST? CST* CST#	N/A	N/A
Real-time Clock Date	DAY=	6 bytes	Command or Query. A date in the form ddmmyy, where: dd = day of the month (01 to 31), mm = month (01 to 12) yy = year (00 to 99) **Example:** DAY=240457 (April 24, 2057)	DAY= DAY? DAY* DAY#	DAY?	DAY=ddmmyy
Demodulator Lock Status	N/A	1 byte	Query only. Demodulator Lock Status in the form x, where: 0 = Demodulator Unlocked 1 = Demodulator Locked **Example:** DLK=1 (Demodulator Locked)	DLK? DLK* DLK#	DLK?	DLK=x
Eb/No Alarm Point	EBA=	4 bytes	Command or Query. Eb/No alarm point in dB, with a range between 0.1 and 16 dB. Resolution=0.1 dB **Example:** EBA=12.3	EBA= EBA? EBA* EBA#	EBA?	EBA=xx.x (See Description of Arguments)
Rx Eb/No	N/A	4 bytes	Query only. Unit returns the value of Eb/No (when in DVB-S or DVB-DSNG mode), between 0 and 16 dB, resolution 0.1 dB. Returns 99.9 if demod is unlocked. **Example:** EBN=12.3 (Eb/No specified = 12.3 dB) For values greater than 16.0 dB, the reply will be: **EBN=+016**	EBN? EBN* EBN#	EBN?	EBN=xxxx

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
External Reference Frequency	ERF=	1 byte	Command or Query. External Reference Frequency in the form x, where: 0=Internal 1=External 1 MHz 2=External 2 MHz 3=External 5 MHz 4=External 10 MHz 5=External 20 MHz **Example:** ERF=0 (Internal selected - External reference not used)	ERF= ERF? ERF* ERF#	ERF?	ERF=x
Equipment ID	N/A	23 bytes	Query only. Unit returns equipment identification and configuration, where: **aaa = defines the modulator model number (710)** **b = Modulator configuration**: 1=70/140 Mhz, 2=L-Band **c = Tx Symbol Rate S/W option:** 0 = 15.0 Msps, 1 = 22.5 Msps, 2 = 30.0 Msps, 3 = 37.5 Msps (S1 and DSNG only), 4 = 45.0 Msps (S1 and DSNG only) **d = S/W option Tx 8PSK:** 0=Not installed, 1=Installed **e = S/W option Tx 16-QAM:** 0=Not installed, 1=Installed **f = S/W option Tx 16APSK:** 0=Not installed, 1=Installed **g = S/W option Tx 32APSK:** 0=Not installed, 1=Installed **h = S/W option Tx DVB-S1:** 0=Not installed, 1=Installed **i = S/W option Tx DVB-DSNG:** 0=Not installed, 1=Installed **j = S/W option Tx DVB-S2:** 0=Not installed, 1=Installed **k = Demodulator configuration:** 0=None, 1=70/140 Mhz, 2=L-Band **l = Rx Symbol Rate S/W option:** 0=15.0 Msps, 1 = 22.5 Msps, 2 = 30.0 Msps, 3 = 37.5 Msps (S1 & DSNG only), 4 = 45.0 Msps (S1 & DSNG only) **m = S/W option Rx 8PSK:** 0=Not installed, 1=Installed **n = S/W option Rx 16-QAM:** 0=Not installed, 1=Installed **o = S/W option Rx 16APSK:** 0=Not installed, 1=Installed **p = S/W option Rx 32APSK:** 0=Not installed, 1=Installed **q = S/W option Rx DVB-S1:** 0=Not installed, 1=Installed **r = S/W option Rx DVB-DSNG:**0=Not installed, 1=Installed **s = S/W option Rx DVB-S2:** 0=Not installed, 1=Installed **t = Interface slot #1:** 0 = None, 1 = ASI, 2 = Gigabit Ethernet Interface, 3 = HSSI **u = Interface slot #2:** 0 = None, 1 = ASI, 2 = Gigabit Ethernet Interface, 3 = HSSI	EID? EID* EID#	EID?	EID= aaabcdefghijklmnopqrstu **Notes:** 1. Unit returns 'Not Installed' for Rx options if unit is modulator only. 2. Unit returns 'Not Installed' for Tx options if unit is demodulator only.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Es/No	N/A	4 bytes	Query only. Unit returns the value of EsNo (when in DVB-S2 mode), between 0 and 16 dB, resolution 0.1 dB. Returns 99.9 if demod is unlocked. **Example:** ESN=12.3 (Es/No specified is 12.3 dB) For values greater than 22.0 dB, the reply will be: **ESN=+022**	ESN? ESN* ESN#	ESN?	ESN=xxxx
Enable Redundancy Switch Mode	ESW=	1 byte, value of 0 or 1	Command or Query. Set redundancy mode in the form x, where : 0 = Disable 1 = Enable **Example:** ESW=1 (Redundancy Mode enabled)	ESW= ESW? ESW* ESW#	ESW?	ESW=x
Faults and Status	N/A	5 bytes	Query only. Unit returns the current fault and status codes for the Unit (hardware), Tx Traffic and Rx Traffic, in the form abcd, where: a = Unit Faults: 0=No faults 1=Framer FPGA Load 2=Power supply fault, +1.5 Volts, Framer Card 3=Power supply fault, +1.5 Volts, Interface #1 4=Power supply fault, +1.5 Volts, Interface #2 5=Power supply fault, +3.3 Volts, Framer Card 6=Power supply fault, +5.0 Volts, Framer Card 7=Power supply fault, +12.0 Volts, Framer Card 8=Power supply fault, -12.0 Volts, Framer Card 9=Power supply fauilt, +18.0 Volts, Framer Card A=FLASH Checksum B=FEC1 Load C=FEC2 Load D=Interface #1 Load E=Interface #2 Load F=192 MHz PLL G=External Reference H=Framer Card Temperature I=Modem Temperature J=Cooling Fans K=Interface #1 Removed L=Interface #2 Removed b = Tx Traffic Status: 0=No faults	FLT? FLT* FLT#	FLT?	FLT=abcd d=Change in fault status since last poll. **Note:** Each section has faults listed in order of priority. For each section, only the highest priority fault is returned. There maybe multiple faults for each section, but only the highest fault is returned.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
			c=Rx Traffic Status 0=No faults 1=+1.5V Demod Power Supply Unit (Demodulator Card) 2=FPGA Load (Demodulator Card) 3=Demod Unlocked 4=DSNG Sync Error 5=FPGA Temperature (Demodulator Card) 6=Reserved 7=AGC Level Out of Range 8=Eb/No Limit Exceeded 9=Demodulator Synth 1 PLL A=Demodulator Synth 2 PLL B= SERDES Demod to Framer C= SERDES Framer to FEC1 D= SERDES Framer to FEC2 E=Reserved F= MPEG transport stream error. G=ASI Rx PLL Empty (Interface 1) H=ASI Rx PLL Full (Interface 1) I=ASI Rx PLL Lower Limit Reached (Interface 1) J=ASI Rx PLL Upper Limit Reached (Interface 1) K=Reserved L=Reserved M=Reserved N=Reserved O=Reserved P=ASI Rx SERDES Error (Interface 1) Q=ASI Rx SERDES DCM Unlocked (Interface 1) R= Reserved S= Reserved T=HSSI Rx Buffer Underrun (Interface 1) U=HSSI Rx Buffer Overflow (Interface 1) V=Reserved W=Reserved X=Framer SERDES Rx Fault (Interface 1) Y=Framer SERDES Rx Fault (Interface 2) Z=Reserved [=Reserved d=New Faults 0=No new faults 1=New faults since last check			

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Firmware Revisions	N/A	1 byte	Query only. Query the version information of the system, where: i = Bulk Image number (1 or 2) a = Firmware Image b = Firmware Revision c = Firmware Date **Example:** FRW?1	FRW? FRW* FRW#	FRW?i	FRW={CR}Boot:{CR}a,b,c{CR} Bulki:{CR}a,b,c{CR}a,b,c…
Gigabit Egress FEC Enable	GEF=	2 bytes	Command or Query. Gigabit Egress FEC Enable/Disable in the form sn, where: s=Slot (1, 2) n=Enable / Disable, where 0 = Disabled 1 = Enabled	GEF= GEF# GEF? GEF*	GEF?s	GEF=sn
Gigabit Egress Multicast Group Address	GEG=	16 bytes	Command or Query. Gigabit Egress Multicast Group Address. The multicast stream egressing from the gigabit interface will have this IP address as the source IP address in the form siii.iii.iii.iii, where: s=Slot (1, 2) i=IP Address	GEG= GEG# GEG? GEG*	GEG?s	GEG=siii.iii.iii.iii
Gigabit Egress Port Numbers	GEP=	11 bytes	Command or Query. Gigabit Egress Port Numbers in the form snnnnnppppp, where: s=Slot (1, 2) nnnnn = Source Port Number (0 – 65535) ppppp = Destination Port Number (0 – 65535) **Note:** Both Source Port and Destination Port must be valid for set command to take effect.	GEP= GEP# GEP? GEP*	GEP?s	GEP=snnnnnppppp
Gigabit Egress FEC Matrix	GFM=	6 bytes	Command or Query. Gigabit Egress FEC Matrix in the form sll,dd where: s=Slot (1, 2) ll = Length, two digit number (leading zero) between 1 and 20. dd = Depth, two digit number (leading zero) between 4 and 20. **Note:** Length x Depth, must be less than or equal to 100)	GFM= GFM # GFM? GFM*	GFM?s	GFM=sll,dd
Gigabit FEC Base Port	GFP=	6 bytes	Command or Query. Gigabit FEC Base Port number in the form snnnnn, where: s=Slot (1, 2) n=Port Number (0 – 65535)	GFP= GFP# GFP? GFP*	GFP?s	GFP=snnnnn
Gigabit Management IP Address and Subnet	GIP=	19 bytes	Command or Query. Gigabit Management IP address and subnet mask in the form siii.iii.iii.iii.nn, where: s=Slot (1, 2) i=IP Address n=Netmask	GIP= GIP# GIP? GIP*	GIP?s	GIP=siii.iii.iii.iii.nn

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Gigabit Multicast Address	GMI=	17 bytes	Command or Query. Gigabit Multicast Address in the form smiii.iii.iii.iii, where: s=Slot (1, 2) m=Multicast Stream (1, 2) i=IP Address	GMI= GMI# GMI? GMI*	GMI?sm	GMI=smiii.iii.iii.iii
Gigabit Active Stream	N/A	2 bytes	Command or Query. Gigabit Active Stream in the form sm, where: s=Slot (1, 2) m=Stream (1, 2)	GSA= GSA# GSA? GSA*	GSA?s	GSA=sm
Gigabit Source IP Address	GSI=	17 bytes	Command or Query. Gigabit Source IP Address in the form smiii.iii.iii.iii, where: s=Slot (1, 2) m=Multicast Stream (1, 2) i=IP Address	GSI= GSI# GSI? GSI*	GSI?sm	GSI =smiii.iii.iii.iii
Gigabit Stream Mode	GSM=	2 bytes	Command or Query. Gigabit Stream Mode in the form sm, where: s=Slot (1, 2) m=Mode 1=Single Stream 2=Dual Stream (Redundancy Mode)	GSM= GSM# GSM? GSM*	GSM?s	GSM=sm
Gigabit Primary Stream	GSP=	2 bytes	Command or Query. Gigabit Primary Stream in the form sm, where: s=Slot (1, 2) m=Multicast Stream (1, 2)	GSP= GSP# GSP? GSP*	GSP?s	GSP=sm
Gigabit Stream Timeout Mode	GTM=	2 bytes	Command or Query. Gigabit Stream Timeout Mode in the form sm, where: s=Slot (1, 2) m=Mode 0 = Non-revertive 1 = Revertive **Note:** Only used when in Dual Stream Mode. When in redundancy mode, this parameter controls whether the Gigabit Interface switches back and forth between the two input streams for a valid MPEG stream. Revertive (GSM =1) means the interface will switch back and forth between the two streams. Non-revertive is a latching scheme where the interface will only switch to the secondary stream.	GTM= GTM# GTM? GTM*	GTM?s	GTM=sm
Gigabit Stream Timeout	GTO=	3 bytes	Command or Query. Gigabit Stream Timeout (Only used when in Dual Stream Mode) in the form stt, where: s=Slot (1, 2) t=Timeout in 100 mS intervals (0 – 10)	GTO= GTO# GTO? GTO*	GTO?s	GTO=stt

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Initialize Events Pointer	IEP=	None	Command only. Resets internal pointer to allow RNE? queries to start at the beginning of the stored events log.	IEP= IEP? IEP* IEP#	N/A	N/A
Boot Image	IMG=	1 byte	Command only. Boot image selection, where n is the image number in the form n, where: 1=Image #1 2=Image #2 **Example:** IMG=1 (Image #1 selected for booting.)	IMG= IMG? IMG* IMG#	IMG?	IMG=n
IP Address	IPA=	18 bytes	Command or Query. Used to set the IP address and network prefix for the 10/100 BaseTx Ethernet management port, in the form xxx.xxx.xxx.xxx.yy, where: xxx.xxx.xxx.xxx is the IP address yy is the network prefix (00..31) **Example:** IPA=010.006.030.001.24	IPA= IPA? IPA* IPA#	IPA?	IPA= xxx.xxx.xxx.xxx.yy
Gateway Address	IPG=	15 bytes	Command or Query. Used to set the Gateway IP addess for the 10/100 Base Tx Ethernet management port, in the form xxx.xxx.xxx.xxx, where: xxx.xxx.xxx.xxx is the IP address **Example:** IPG = 010.006.030.001	IPG= IPG? IPG* IPG#	IPG?	IPG = xxx.xxx.xxx.xxx
Interface Type	N/A	2 bytes	Query only. Interface Type in the form sx, where: s=Defines which interface slot (1 or 2) x=Defines the interface type, where: 0=ASI 1=Gigabit Ethernet 2=HSSI **Example:** ITF?1	ITF? ITF* ITF#	ITF?s	ITF=sx
Rx Link Margin	N/A	4 bytes	Query only. Unit returns the value of the Link Margin. Returns 00.0 if demod is unlocked. **Example:** LNK=12.3	LNK? LNK* LNK#	LNK?	LNK=xxxx
Local/Remote Status	LRS=	1 byte	Command or Query. Local/Remote status in the form x, where: 0=Local 1=Serial 2=Reserved 3=Ethernet 4=Serial+Ethernet **Example:** LRS=1 (Serial Remote selected)	LRS= LRS? LRS* LRS#	LRS?	LRS=x
Unit MAC Address	N/A	12 bytes	Query only. MAC address of the unit, reported in hexadecimal. **Example:** MAC=0006B000D2A7 (The MAC address of the unit is 00:06:B0:00:D2:A7)	MAC? MAC* MAC#	MAC?	MAC=AABBCCDDEEFF

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Unit Alarm Mask	MSK=	2 bytes	Command or Query. Alarm mask conditions, in the form ab, where: a=Tx AIS (0 = Alarm, 1 =Fault, 2 = Masked) b=Spare **Example:** MSK = 00	MSK= MSK? MSK* MSK#	MSK?	MSK=ab
Number of Unread stored Events	N/A	3 bytes	Query only. Unit returns the Number of Unread Events, which remain stored, in the form xxx. **Note:** This means unread over the remote control. **Example:** NUE=126	NUE? NUE* NUE#	NUE?	NUE=xxx
Rx PER	N/A	7 bytes	Query only. Units returns the value of the estimated PER in the form a.bEscc, representing **ab x 10^{-c}**. First three bytes are the value; last two bytes are the exponent. Returns 0.0E+00 if the demodulator is unlocked. **Example:** PER=4.8E-03 (PER is 4.8 x 10^{-3})	PER? PER* PER#	PER?	PER=a.bEscc
Rx Alpha Rolloff	RAR=	1 byte	Command or Query. Rx Alpha Rolloff in the form x, where: 0 = 20% 1 = 25% 2 = 35% **Example:** RAR=0 (Rx Alpha Rolloff of 20% selected)	RAR= RAR? RAR* RAR#	RAR?	RAR=x
Rx Buffer Size	RBS=	5 bytes	Command or Query. Rx Buffer Size (in milliseconds) in the form sxx.x, where: s=Defines which interface slot (1 or 2) xx.x= Rx Buffer Size, HSSI = 5.0 to 32.0 ms, in 0.1 ms steps GBEI = N/A ASI = N/A **Example:** RBS=130.0 (selects 30.0 ms on interface 1)	RBS= RBS? RBS* RBS#	RBS?s	RBS=sxx.x (See Description of Arguments)
Soft Reboot	RBT=1	1 byte	Command only. Soft Reboot. 1= Reboot System	RBT? RBT* RBT#	N/A	RBT=
Rx Clock Invert	RCI=	2 bytes	Command or Query. Invert Receive Clock in the form sx, where: s=Defines which interface slot (1 or 2) x=Invert Receive Clock, where: 0=Normal 1=Inverted **Note:** Command valid Only with HSSI **Example:** RCI = 11 (Inverted RX Clock, Slot 1 selected)	RCI = RCI? RCI * RCI #	RCI?s	RCI =sx (See Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Clock Source	RCK=	2 bytes	Command or Query. Rx Clock Source (for data rate accuracy) in the form sx, where: s=Defines which interface slot (1 or 2) x=Rx Clock Source, where: 0=Rx Satellite 1=Tx-Terrestrial 2=External Reference Clock 3=Internal (HSSI Only) **Example:** RCK=11 (Tx-Terrestrial selected)	RCK= RCK? RCK* RCK#	RCK?s	RCK=sx (See Description of Arguments)
Rx Data Invert	RDI=	2 bytes	Command or Query. Invert Receive Data in the form sx, where: s=Defines which interface slot (1 or 2) x=Invert Receive Data, where: 0=Normal 1=Inverted **Note:** Command valid Only with HSSI. **Example:** RDI = 11 (Inverted RX Data selected)	RDI = RDI? RDI* RDI#	RDI?sc	RDI =sx (See Description of Arguments)
Rx Data Rate	N/A	10 bytes	Query only. Composite Rx Data rate, in kbps, in the form xxxxxx.xxx. Resolution=1 bps. **Example:** RDR=002047.999 (2047.999 kbps specified)	RDR? RDR* RDR#	RDR?	RDR=xxxxxx.xxx
Redundancy State	RED=	1 byte	Command or Query. Unit returns the redundancy state of the unit in the form x, where: 0 = Offline 1 = Online **Notes:** 1. This command can be used to force the unit offline, this is done by sending RED=0. This is only valid if redundancy mode is enabled – if redundancy is not enabled, then RED=0 will return an error. The unit cannot be forced online. 2. If the unit is not in redundancy mode, then the unit will always be online. **Example:** RED=0 (force unit offline)	RED= RED? RED* RED#	RED?	RED=x (See Description of Arguments)
Rx Frequency Offset	N/A	5 bytes	Query only. Unit returns the value of the measured frequency offset of the carrier being demodulated in the form sxxx.x. Values range from ± 0 to ± 100 kHz, 100 Hz resolution. Returns 999999 if the demodulator is unlocked. **Example:** RFO=+002.3 (which is + 2.3 kHz)	RFO? RFO* RFO#	RFO?	RFO=sxxx.x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Frequency	RFQ=	9 bytes	Command or Query. Rx Frequency (in MHz) in the form xxxx.xxxx: 52 to 88 MHz, and 104 to 176 MHz (70/140 Modulator) 950 to 1950 MHz (L-Band Modulator) Resolution=100Hz. **Example:** RFQ=0950.0000	RFQ= RFQ? RFQ* RFQ#	RFQ?	RFQ=xxxx.xxxx
Rx Frame Size	N/A	1 byte	Query only. Rx Frame Size Long/Short selection in the form x, where: 0=Short, 1=Long **Example:** RFS =0 (which is Short Frame Size) **Note:** Valid only in DVB-S2 mode. If the unit is not locked, the query returns 'x'.	RFS? RFS * RFS #	RFS?	RFS =x
Rx FEC Type	N/A	1 byte	Query only. Rx FEC coding type in the form x, where: 0=Viterbi + Reed-Solomon 1=LDPC **Note:** FEC is dependent on the RX Mode Type. **Example:** RFT=1 (which is LDPC coding)	RFT? RFT* RFT#	RFT?	RFT=x
Rx Gold Code Sequence Index	RGS=	6 bytes	Command or Query. Rx Gold Code Sequence Index: xxxxxx = Gold Code Sequence index (0 to 262141) **Example:** RGS=189063 **Note:** Valid only in DVB-S2 mode.	RGS= RGS? RGS* RGS#	RGS?	RGS=xxxxxx
Rx Interface Enable	RIE=	2 bytes	Command or Query. Interface Slot Enable/Disable in the form sx, where: s=Defines which interface slot (1 or 2) x=Rx Interface Status, where: 0=Disabled 1=Enabled **Example:** RIE =11 (Slot 1 Rx interface enabled)	RIE= RIE? RIE* RIE#	RIE?s	RIE=sx

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Retrieve next 5 unread Stored Events	N/A	75 bytes	Query only. Unit returns the oldest 5 Stored Events which have not yet been read over the remote control in the form {CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body, where Sub-body= ABCddmmyyhhmmss is as follows: A being the fault/clear indicator. F=Fault C=Clear I=Info B being the fault type where: 1=Unit 2=Rx Traffic 3=Tx Traffic 4=Log C is Fault Code numbers, as in FLT? or Info Code, which is: 0=Power Off 1=Power On 2=Log Cleared 3=Global Config Change 4=Redundancy Config Change If there are less than 5 events to be retrieved, the remaining positions are padded with zeros. If there are no new events, the response is RNE*.	RNE? RNE* RNE#	RNE?	RNE={CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss
Rx Pilot On/Off	N/A	1 byte	Command or Query. Rx Pilot On/Off selection in the form x, where: 0=Off, 1=On **Example:** RPI=0 (Pilot Off selected) **Note:** Valid only in DVB-S2 mode. This is automatically detected on demod acquisition, but if the unit is not locked, the query returns 'x'.	RPI= RPI? RPI* RPI#	RPI?	RPI=x
Rx Signal Level	N/A	3 bytes	Query only. Unit returns the value of the Rx signal level, in dBm, between +3.0 and –99.0 dBm, in the form xxx where; xxx is the Rx signal level. **Examples:** RSL=+03 RSL=-41	RSL? RSL* RSL#	RSL?	RSL=xxx
Rx Demod Acquisition Sweep Width	RSW=	3 bytes	Command or Query. Rx ± acquisition sweep range of demodulator, in kHz, ranging from ± 1 to ± 100 kHz in the form xxx. **Example:** RSW=009 (± 9 kHz selected)	RSW= RSW? RSW* RSW#	RSW?	RSW=xxx (See Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Transport Mode	N/A	1 byte	Query only. Reads the transport mode for DVB-S2 mode only in the form x, where: 0 = Generic Mode 1 = Transport Stream (Default) **Note:** Command applies only with DVB-S2 and HSSI. For any other mode, set RTM to 1. **Example:** RTM=1 (Transport Stream selected)	RTM? RTM* RTM#	RTM?	RTM=x
Serial Number	N/A	9 bytes	Query only. Used to query the unit 9-digit serial number. Unit returns its S/N in the form xxxxxxxxx. **Example:** SNO=176500143	SNO? SNO* SNO#	SNO?	SNO=xxxxxxxxx
Software Revision	N/A	5 bytes	Query only. Unit returns the value of the internal software revision installed in the unit, in the form Boot:X.X.X Bulk1:Y.Y.Y Bulk2: Z.Z.Z. **Example:** SWR=Boot:1.0.3 Bulk1:1.0.1 Bulk2:1.0.0	SWR? SWR* SWR#	SWR?	SWR=Boot:X.X.X Bulk1:Y.Y.Y Bulk2:Z.Z.Z
Real-time Clock Time	TIM=	6 bytes	Command or Query. A time as indicated from midnight, in the form hhmmss, where: hh = hours (00 to 23) mm = minutes (00 to 59) ss = seconds (00 to 59) **Example:** TIM=231259 (23 hours: 12 minutes: 59 seconds)	TIM= TIM? TIM* TIM#	TIM?	TIM=hhmmss
Temperature	N/A	3 bytes	Query only. Unit returns the value of the internal temperature, in degrees C, in the form sxxx, where: s=sign (+ or -) xxx=number of degrees. **Example:** TMP=+026	TMP? TMP* TMP#	TMP?	TMP=sxxx
Test Pattern	TPT=	1 byte	Command or Query. Set Test Pattern in the form x, where: 0=Off 1=2047 2=2^23-1 **Example:** TPT=1 (2047)	TPT= TPT? TPT * TPT #	TPT?	TPT=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Transmit & Receive Configuration	TRC=	69 bytes	Command or Query. Global configuration, in the form: aaa.aaaabcc.ccccccdefghhhhhhiii.ijkllll.llllmnn.nnnnnnopqrssssssstuvv, where: aaaa.aaaa = Tx Frequency (in MHz) same as TFQ b = Tx Mode same as TMM cc.cccccc = Tx Symbol Rate same as TSR d = Tx FEC Type same as TFT ** e = Tx Modulation type same as TMD f = Tx FEC Rate same as TCR g = Tx Spectrum Inversion same as TSI hhhhhh = Tx Gold Code Sequence same as TGS iii.i = Tx Power Level same as TPL j = Tx Carrier State same as TXO k = Tx Alpha Roll-off same as TAR llll.llll = Rx Frequency (in MHz) same as RFQ m = Rx Mode same as RMM nn.nnnnnn = Rx Symbol Rate same as RSR o = Rx FEC Type same as RFT ** p = Rx Modulation type same as RMD q = Rx FEC Rate same as RCR x = spare ssssss = Rx Gold Code Sequence same as RGS t = Rx Alpha Roll-off same as RAR u = Unit test Mode same as TST** vv = Unit Alarm Mask same as MSK ** Read-only	TRC= TRC? TRC* TRC#	TRC?	TRC= aaaa.aaaabcc.ccccccdefghhhhhhiii.ijkllll.llllmnn.nnnnnnopqxssssssstuvv Returns current transmit and receive configuration. **Notes:** 1. Unit returns ‘x’s for Rx parameters if unit is modulator only. 2. Unit returns ‘x’s for Tx parameters if unit is demodulator only. 3. If Rx is in DVB-S2 mode, the Rx Modulation Type and Rx FEC Rate is ignored because these are automatically detected.
Unit Test Mode	TST=	1 byte	Command or Query. Test Mode in the form x, where: 0=Normal Mode (no test) 1=IF Loop 2=I/O Loop 3=RF Loop 4=Tx CW 5=Tx Alternating 1,0 Pattern **Example:** TST=4 (Tx CW)	TST= TST? TST* TST#	TST?	TST=x

A.6.5 Modem Global Configuration (MGC) Command

The MGC command can be used to configure the whole modem or parts of the modem. This command also contains spare bytes for future development, but the length of the command is fixed to 255 bytes. The MGC command can be used on modulator-only units, demodulator-only units, and modem units.

A.6.5.1 MGC Format

The format for the response to the MGC query/command is **MGC=TRUSI[Tx Block][Rx Block][Unit Block][Interface Block]** where:

TRUSI – For a *query*, the first 5 bytes indicates whether the corresponding block is present in the response:

T – 'T' if transmit block is present in the response, '0' means the block is not present and 'x's are returned.
R – 'R' if receive block is present in the response, '0' means the block is not present and 'x's are returned.
U – 'U' if unit block is present in the response, '0' means the block is not present and 'x's are returned.
S – Indicates which interface slot is enabled. '1' indicates that slot 1 is enabled. '2' indicates that slot 2 is enabled.
I – Indicates the interface type for the interface block. '1' indicates ASI, '2' indicates Gigabit Ethernet interface, '3' indicates HSSI.

For a *set command*, the first 5 bytes indicates whether the corresponding block should be reprogrammed:

T – 'T' if transmit configuration should be changed, '0' means the Tx configuration should be skipped over.
R – 'R' if receive configuration should be changed, '0' means the Rx configuration should be skipped over.
U – 'U' if unit configuration should be changed, '0' means the unit configuration should be skipped over.
S – Indicates which slot should be enabled. '1' indicates that slot 1 should be enabled. '2' indicates that slot 2 should be enabled.
I – Indicates the interface type for the interface block. '1' indicates ASI, '2' indicates Gigabit Ethernet interface, '3' indicates HSSI.

MGC ASI Example:

<0000/MGC=TRU111250.0000101.0000001070-10.0101000000001xxxxxxxxxx1250.0000101.00
00001070101010000000002.01xxxxxxxxxx00000xxxxxxxxxxxxxxxx0100xxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxx

MGC HSSI Example:

<0000/MGC=TRU111250.0000101.0000001070-10.0101000000001xxxxxxxxxx1250.0000101.00
00001070101010000000002.01xxxxxxxxxx00000xxxxxxxxxxxxxxxx0000321.1xxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxx

[Tx Block] consists of 50 bytes for Transmit configuration, in the form aaaa.aaaabcc.ccccccdefghhh.hijklmmmmmmmnoxxxxxxxxxx where:

aaaa.aaaa = Tx Frequency (in MHz)	same as TFQ
b = Tx Mode	same as TMM
cc.cccccc = Tx Symbol Rate	same as TSR
d = Tx FEC Type	same as TFT (read-only)
e = Tx Modulation type	same as TMD
f = Tx FEC Rate	same as TCR
g = Tx Spectrum Inversion	same as TSI
hhh.h = Tx Power Level	same as TPL
i = Tx Carrier State	same as TXO
j = Tx Alpha Roll-off	same as TAR
k = Tx Frame Size	same as TFS
l = Tx Pilots	same as TPI
mmmmmm = Tx Gold Code Sequence	same as TGS
n = Tx Location of Pilot	same as TLP
o = Tx Transport Stream	same as TTM (in DVB-S2 & HSSI mode)
xxxxxxxxxx = Spare bytes.	

[Rx Block] consists of 50 bytes for Receive configuration, in the form aaaa.aaaabcc.ccccccdefggghijkllllllmm.mnxxxxxxxxxx where:

aaaa.aaaa = Rx Frequency (in MHz)	same as RFQ
b = Rx Mode	same as RMM
cc.cccccc = Rx Symbol Rate	same as RSR
d = Rx FEC Type	same as RFT (read-only)
e = Rx Modulation Type	same as RMD (read-only in DVB-S2 mode)
f = Rx FEC Rate	same as RCR (read-only in DVB-S2 mode)
ggg = Rx Sweep Width	same as RSW
h = Rx Adaptive Equalizer	same as AEQ
i = Rx Alpha Roll-off	same as RAR
j = Rx Frame Size	same as RFS (read-only)
k = Rx Pilots	same as RPI (read-only)
llllll = Rx Gold Code Sequence	same as RGS
mm.m = Rx EbNo Alarm Point	same as EBA
n = Rx Transport Stream	same as RTM (read-only in DVB-S2 & HSSI mode)
xxxxxxxxxx = Spare bytes.	

[Unit Block] consists of 20 bytes for Unit Configuration, the format is: abccdxxxxxxxxxxxxxxx

a = Test Mode	same as TST
b = Test Pattern	same as TPT
cc = Alarm Mask	same as MSK
d = External Reference Frequency	same as ERF
xxxxxxxxxxxxxxx = Spare bytes.	

[Interface Block] consists of 130 bytes and contains the configuration of the current enabled interface on the unit. The format of the configuration bytes depend on the interface type indicated by the 5th byte in the MGC query or command.

- **If ASI Interface:** The [Interface Block] is in the form abcdx…xxx **where:**

a = ASI Bandwidth	same as TAB (omit interface slot parameter)
b = ASI Port	same as TIP (omit interface slot parameter)
c = ASI Tx Frame Size	same as ATF (omit interface slot parameter)
d = ASI Rx Frame Size	same as ARF (omit interface slot parameter)
x…xxx = spare bytes	

- **If Gigabit Ethernet Interface:** The [Interface Block] is in the form aaa.aaa.aaa.aaabbb.bbb.bbb.bbbccc.ccc.ccc.cccddd.ddd.ddd.dddeefghiiiiijkkk.kkk.kkk.kkklmmmmmmnnnnnooppxxx…xxx where:

aaa.aaa.aaa.aaa = Ingress Multicast Group Address #1	same as GMI (omit interface slot parameter)
bbb.bbb.bbb.bbb = Ingress Multicast Group Address #2	same as GMI (omit interface slot parameter)
ccc.ccc.ccc.ccc = Ingress Multicast Source Address #1	same as GSI (omit interface slot parameter)
ddd.ddd.ddd.ddd = Ingress Multicast Source Address #2	same as GSI (omit interface slot parameter)
ee = Buffer Timeout	same as GTO (omit interface slot parameter)
f = Primary Stream	same as GSP (omit interface slot parameter)
g = Stream Mode	same as GSM (omit interface slot parameter)
h = Ingress FEC Enable	same as GFE (omit interface slot parameter)
iiiii = Ingress UDP Port	same as GFP (omit interface slot parameter)
j = Buffer Timeout Mode	same as GTM (omit interface slot parameter)
kkk.kkk.kkk.kkk = Egress Multicast Group	same as GEG (omit interface slot parameter)
l = Egress FEC Enable	same as GEF (omit interface slot parameter)
mmmmm = Egress Source Port	same as GEP (omit interface slot parameter)
nnnnn = Egress Destination Port	same as GEP (omit interface slot parameter)
oo = FEC Matrix Length	same as GFM (omit interface slot parameter)
pp = FEC Matrix Depth	same as GFM (omit interface slot parameter)
xxx…xxx = spare bytes	

- **If HSSI Interface:** The [Interface Block] is in the form abcdeff.fx…xxx where:

a = Tx Data Inversion	same as TDI (omit interface slot parameter)
b = Rx Data Inversion	same as RDI (omit interface slot parameter)
c = Tx Clock Inversion	same as TCI (omit interface slot parameter)
d = Rx Clock Inversion	same as RCI (omit interface slot parameter)
e = Rx Clock Source	same as RCK (omit interface slot parameter)
ff.f = Rx Buffer Size	same as RBS (omit interface slot parameter)
x…xxx = spare bytes	

Notes:

Appendix B. Eb/No MEASUREMENT

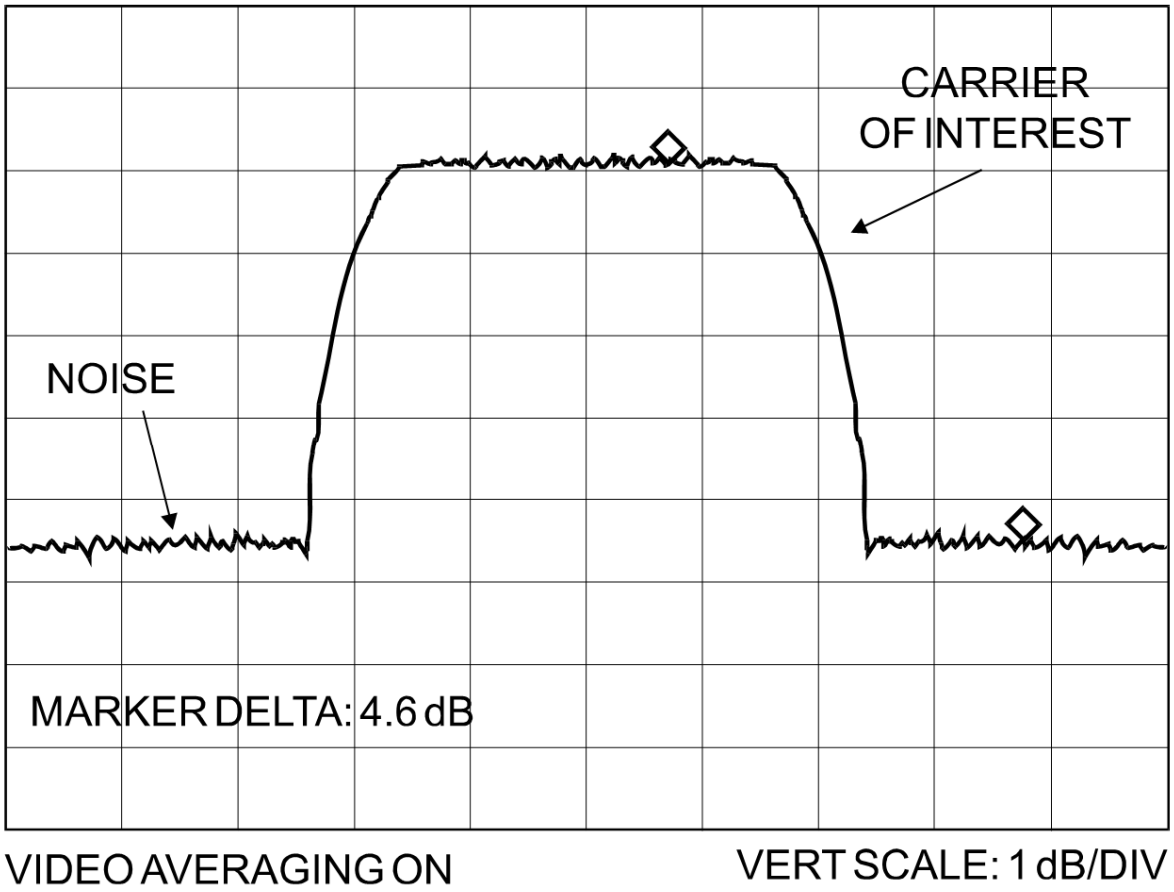
Although the CDM-710 calculates and displays the value of receive Eb/No on the front panel of the unit, it is sometimes useful to measure the value using a spectrum analyzer, if one is available.

The idea is to accurately measure the value of (Co+No)/No, (Carrier density + Noise density/Noise density). This is accomplished by tuning the center frequency of the Spectrum analyzer to the signal of interest, and measuring the difference between the peak spectral density of the signal (the flat part of the spectrum shown) and the noise density. To make this measurement:

- Use a vertical scale of 1 or 2 dB/division.
- Set the Resolution Bandwidth of the Spectrum Analyzer to <20% of the symbol rate.
- Use video filtering and/or video averaging to reduce the variance in the displayed trace to a low enough level that the difference can be measured to within 0.2dB.
- Place a marker on the flat part of the signal of interest, then use the MARKER DELTA function to put a second marker on the noise to the side of the carrier. This value is (Co+No)/No, in dB.
- Use this value of (Co+No)/No in the table on the following page to determine the Eb/No. You will need to know the operating mode to read from the appropriate column.
- If the (Co+No)/No value measured does not correspond to an exact table entry, interpolate using the two nearest values.

Note that the accuracy of this method degrades significantly at low values of (Co+No)/No (approximately less than 6 dB).

Example: In the diagram that follows, the (Co+No)/No measured is 4.6 dB. If Rate 1/2 QPSK is used, this corresponds to an Eb/No of approximately 2.8 dB (DVB-S2) or 3.1 dB (DVB-S).



The relationship used to derive the table values is as follows (only simple way for DVB-S2):

$$\mathbf{Eb/No = 10log10(10^{((Co+No)/No)/10)} -1) - 10log10(Spectral\ Efficiency)}$$

where:

- **Eb/No** and **(Co+No)/No** are expressed in dB, *and*
- **Spectral Efficiency** includes the modulation type, code rate, overhead and framing and is shown in **Table B-1** and **Table B-2**.

The equation above applies to DVB-S and DVB-DSNG, or use the traditional relationship:

$$\mathbf{Eb/No = 10\ log_{10}(10^{((Co+No)/No)/10)} -1)- 10\ log_{10}(FEC\ Code\ Rate)\ 10\ log_{10}(bits/symbol)}$$

where:

- **Eb/No** and **(Co+No)/No** are expressed in dB;
- **FEC Code Rate** (Composite) = 3/4*(188/204), 7/8*(188/204), etc.
- **bits/symbol** = 2 for QPSK, 3 for 8-PSK, 4 for 16-QAM;
- Pay close attention to the sign of the middle term.

Table B-1. CDM-710 Co+No/No to C/N (Es/No) and Eb/No (dB) For DVB-S And DVB-DSNG

		Code Rate									
		QPSK					8PSK			16QAM	
Spectral Efficiency		0.921569	1.228758	1.382353	1.535948	1.612745	1.843137	2.303922	2.457516	2.764706	3.225490
		1/2	2/3	3/4	5/6	7/8	2/3	5/6	8/9	3/4	7/8
(Co+No)/No	C/N = Es/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No
4.0	1.8	2.1	0.9	0.4	-0.1	-0.3	-0.9	-1.8	-2.1	-2.6	-3.3
4.5	2.6	3.0	1.7	1.2	0.7	0.5	-0.1	-1.0	-1.3	-1.8	-2.5
5.0	3.3	3.7	2.5	1.9	1.5	1.3	0.7	-0.3	-0.6	-1.1	-1.7
5.5	4.1	4.4	3.2	2.7	2.2	2.0	1.4	0.4	0.2	-0.4	-1.0
6.0	4.7	5.1	3.8	3.3	2.9	2.7	2.1	1.1	0.8	0.3	-0.3
6.5	5.4	5.8	4.5	4.0	3.5	3.3	2.7	1.8	1.5	1.0	0.3
7.0	6.0	6.4	5.1	4.6	4.2	4.0	3.4	2.4	2.1	1.6	0.9
7.5	6.6	7.0	5.8	5.2	4.8	4.6	4.0	3.0	2.7	2.2	1.6
8.0	7.3	7.6	6.4	5.8	5.4	5.2	4.6	3.6	3.3	2.8	2.2
8.5	7.8	8.2	6.9	6.4	6.0	5.8	5.2	4.2	3.9	3.4	2.8
9.0	8.4	8.8	7.5	7.0	6.6	6.3	5.8	4.8	4.5	4.0	3.3
9.5	9.0	9.3	8.1	7.6	7.1	6.9	6.3	5.4	5.1	4.6	3.9
10.0	9.5	9.9	8.6	8.1	7.7	7.5	6.9	5.9	5.6	5.1	4.5
10.5	10.1	10.4	9.2	8.7	8.2	8.0	7.4	6.5	6.2	5.7	5.0
11.0	10.6	11.0	9.7	9.2	8.8	8.6	8.0	7.0	6.7	6.2	5.6
11.5	11.2	11.5	10.3	9.8	9.3	9.1	8.5	7.6	7.3	6.8	6.1
12.0	11.7	12.1	10.8	10.3	9.9	9.6	9.1	8.1	7.8	7.3	6.6
12.5	12.2	12.6	11.4	10.8	10.4	10.2	9.6	8.6	8.3	7.8	7.2
13.0	12.8	13.1	11.9	11.4	10.9	10.7	10.1	9.2	8.9	8.4	7.7
13.5	13.3	13.7	12.4	11.9	11.4	11.2	10.6	9.7	9.4	8.9	8.2
14.0	13.8	14.2	12.9	12.4	12.0	11.7	11.2	10.2	9.9	9.4	8.7
14.5	14.3	14.7	13.4	12.9	12.5	12.3	11.7	10.7	10.4	9.9	9.3
15.0	14.9	15.2	14.0	13.5	13.0	12.8	12.2	11.2	11.0	10.4	9.8
15.5	15.4	15.7	14.5	14.0	13.5	13.3	12.7	11.8	11.5	11.0	10.3
16.0	15.9	16.2	15.0	14.5	14.0	13.8	13.2	12.3	12.0	11.5	10.8
16.5	16.4	16.8	15.5	15.0	14.5	14.3	13.7	12.8	12.5	12.0	11.3
17.0	16.9	17.3	16.0	15.5	15.0	14.8	14.3	13.3	13.0	12.5	11.8
17.5	17.4	17.8	16.5	16.0	15.6	15.3	14.8	13.8	13.5	13.0	12.3
18.0	17.9	18.3	17.0	16.5	16.1	15.9	15.3	14.3	14.0	13.5	12.8
18.5	18.4	18.8	17.5	17.0	16.6	16.4	15.8	14.8	14.5	14.0	13.4
19.0	18.9	19.3	18.1	17.5	17.1	16.9	16.3	15.3	15.0	14.5	13.9
19.5	19.5	19.8	18.6	18.0	17.6	17.4	16.8	15.8	15.5	15.0	14.4
20.0	20.0	20.3	19.1	18.6	18.1	17.9	17.3	16.3	16.1	15.5	14.9
20.5	20.5	20.8	19.6	19.1	18.6	18.4	17.8	16.8	16.6	16.0	15.4
21.0	21.0	21.3	20.1	19.6	19.1	18.9	18.3	17.3	17.1	16.5	15.9
21.5	21.5	21.8	20.6	20.1	19.6	19.4	18.8	17.8	17.6	17.1	16.4
22.0	22.0	22.3	21.1	20.6	20.1	19.9	19.3	18.3	18.1	17.6	16.9

Notes:

1. Includes 0.36 dB for bandwidth expansion due to Reed Solomon coding.
2. Shaded values are high error rate or unusable.

Table B-2. CDM-710 Co+No/No to C/N (Es/No) and Eb/No (dB) For DVB-S2 QPSK and 8-APSK

(DVB-S2 uses C/N (Es/No), and Eb/No is shown for information)

		Code Rate																
		QPSK											8PSK					
Spectral Efficiency		0.490243	0.656448	0.789412	0.988858	1.188304	1.322253	1.487473	1.587196	1.654663	1.766451	1.788612	1.779991	1.980636	2.228124	2.478562	2.646012	2.679207
		1/4	1/3	2/5	1/2	3/5	2/3	3/4	4/5	5/6	8/9	9/10	3/5	2/3	3/4	5/6	8/9	9/10
(Co+No)/No	C/N = Es/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No
2.0	-2.3	0.8	-0.5	-1.3	-2.3	-3.1	-3.5	-4.1	-4.3	-4.5	-4.8	-4.9	-4.8	-5.3	-5.8	-6.3	-6.6	-6.6
2.5	-1.1	2.0	0.7	-0.1	-1.0	-1.8	-2.3	-2.8	-3.1	-3.3	-3.6	-3.6	-3.6	-4.1	-4.6	-5.0	-5.3	-5.4
3.0	0.0	3.1	1.8	1.0	0.0	-0.8	-1.2	-1.7	-2.0	-2.2	-2.5	-2.5	-2.5	-3.0	-3.5	-4.0	-4.2	-4.3
3.5	0.9	4.0	2.8	2.0	1.0	0.2	-0.3	-0.8	-1.1	-1.3	-1.5	-1.6	-1.6	-2.0	-2.5	-3.0	-3.3	-3.4
4.0	1.8	4.9	3.6	2.8	1.8	1.0	0.6	0.1	-0.2	-0.4	-0.7	-0.7	-0.7	-1.2	-1.7	-2.1	-2.4	-2.5
4.5	2.6	5.7	4.4	3.6	2.6	1.8	1.4	0.9	0.6	0.4	0.1	0.1	0.1	-0.4	-0.9	-1.3	-1.6	-1.7
5.0	3.3	6.4	5.2	4.4	3.4	2.6	2.1	1.6	1.3	1.2	0.9	0.8	0.8	0.4	-0.1	-0.6	-0.9	-0.9
5.5	4.1	7.2	5.9	5.1	4.1	3.3	2.8	2.3	2.1	1.9	1.6	1.5	1.6	1.1	0.6	0.1	-0.2	-0.2
6.0	4.7	7.8	6.6	5.8	4.8	4.0	3.5	3.0	2.7	2.6	2.3	2.2	2.2	1.8	1.3	0.8	0.5	0.5
6.5	5.4	8.5	7.2	6.4	5.4	4.7	4.2	3.7	3.4	3.2	2.9	2.9	2.9	2.4	1.9	1.5	1.2	1.1
7.0	6.0	9.1	7.9	7.1	6.1	5.3	4.8	4.3	4.0	3.8	3.6	3.5	3.5	3.1	2.6	2.1	1.8	1.8
7.5	6.6	9.7	8.5	7.7	6.7	5.9	5.4	4.9	4.6	4.5	4.2	4.1	4.1	3.7	3.2	2.7	2.4	2.4
8.0	7.3	10.3	9.1	8.3	7.3	6.5	6.0	5.5	5.2	5.1	4.8	4.7	4.7	4.3	3.8	3.3	3.0	3.0
8.5	7.8	10.9	9.7	8.9	7.9	7.1	6.6	6.1	5.8	5.7	5.4	5.3	5.3	4.9	4.4	3.9	3.6	3.6
9.0	8.4	11.5	10.2	9.4	8.5	7.7	7.2	6.7	6.4	6.2	5.9	5.9	5.9	5.4	4.9	4.5	4.2	4.1
9.5	9.0	12.1	10.8	10.0	9.0	8.2	7.8	7.3	7.0	6.8	6.5	6.5	6.5	6.0	5.5	5.0	4.8	4.7
10.0	9.5	12.6	11.4	10.6	9.6	8.8	8.3	7.8	7.5	7.4	7.1	7.0	7.0	6.6	6.1	5.6	5.3	5.3
10.5	10.1	13.2	11.9	11.1	10.1	9.3	8.9	8.4	8.1	7.9	7.6	7.6	7.6	7.1	6.6	6.2	5.9	5.8
11.0	10.6	13.7	12.5	11.7	10.7	9.9	9.4	8.9	8.6	8.5	8.2	8.1	8.1	7.7	7.2	6.7	6.4	6.4
11.5	11.2	14.3	13.0	12.2	11.2	10.4	10.0	9.5	9.2	9.0	8.7	8.7	8.7	8.2	7.7	7.2	7.0	6.9
12.0	11.7	14.8	13.5	12.7	11.8	11.0	10.5	10.0	9.7	9.5	9.2	9.2	9.2	8.7	8.2	7.8	7.5	7.4
12.5	12.2	15.3	14.1	13.3	12.3	11.5	11.0	10.5	10.2	10.1	9.8	9.7	9.7	9.3	8.8	8.3	8.0	8.0
13.0	12.8	15.9	14.6	13.8	12.8	12.0	11.6	11.1	10.8	10.6	10.3	10.3	10.3	9.8	9.3	8.8	8.6	8.5
13.5	13.3	16.4	15.1	14.3	13.4	12.6	12.1	11.6	11.3	11.1	10.8	10.8	10.8	10.3	9.8	9.4	9.1	9.0
14.0	13.8	16.9	15.7	14.9	13.9	13.1	12.6	12.1	11.8	11.6	11.4	11.3	11.3	10.9	10.3	9.9	9.6	9.5
14.5	14.3	17.4	16.2	15.4	14.4	13.6	13.1	12.6	12.3	12.2	11.9	11.8	11.8	11.4	10.9	10.4	10.1	10.1
15.0	14.9	18.0	16.7	15.9	14.9	14.1	13.6	13.1	12.9	12.7	12.4	12.3	12.4	11.9	11.4	10.9	10.6	10.6
15.5	15.4	18.5	17.2	16.4	15.4	14.6	14.2	13.7	13.4	13.2	12.9	12.9	12.9	12.4	11.9	11.4	11.1	11.1
16.0	15.9	19.0	17.7	16.9	15.9	15.1	14.7	14.2	13.9	13.7	13.4	13.4	13.4	12.9	12.4	11.9	11.7	11.6
16.5	16.4	19.5	18.2	17.4	16.5	15.7	15.2	14.7	14.4	14.2	13.9	13.9	13.9	13.4	12.9	12.5	12.2	12.1
17.0	16.9	20.0	18.7	17.9	17.0	16.2	15.7	15.2	14.9	14.7	14.4	14.4	14.4	13.9	13.4	13.0	12.7	12.6
17.5	17.4	20.5	19.3	18.4	17.5	16.7	16.2	15.7	15.4	15.2	15.0	14.9	14.9	14.5	13.9	13.5	13.2	13.1
18.0	17.9	21.0	19.8	19.0	18.0	17.2	16.7	16.2	15.9	15.7	15.5	15.4	15.4	15.0	14.5	14.0	13.7	13.7
18.5	18.4	21.5	20.3	19.5	18.5	17.7	17.2	16.7	16.4	16.3	16.0	15.9	15.9	15.5	15.0	14.5	14.2	14.2
19.0	18.9	22.0	20.8	20.0	19.0	18.2	17.7	17.2	16.9	16.8	16.5	16.4	16.4	16.0	15.5	15.0	14.7	14.7

Notes:

1. Eb/No = Es/No – 10 Log (Spectral Efficiency). **2.** The Required C/N for QEF with FECFrame = 16,200 bits is typically 0.2 to 0.3 dB higher. **3.** Shaded values are high error rate or unusable.

Table B-3. CDM-710 Co+No/No to C/N (Es/No) and Eb/No (dB) For DVB-S2 16-APSK and 32-APSK

(DVB-S2 uses C/N (Es/No), and Eb/No is shown for information)

		Code Rate										
		16APSK						32APSK				
Spectral Efficiency		2.637201	2.966728	3.165623	3.300184	3.523143	3.567342	3.703295	3.951571	4.119540	4.397854	4.453027
		2/3	3/4	4/5	5/6	8/9	9/10	3/4	4/5	5/6	8/9	9/10
(Co+No)/No	C/N = Es/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No
9.0	8.4	4.2	3.7	3.4	3.2	2.9	2.9	2.7	2.4	2.3	2.0	1.9
9.5	9.0	4.8	4.3	4.0	3.8	3.5	3.5	3.3	3.0	2.8	2.6	2.5
10.0	9.5	5.3	4.8	4.5	4.4	4.1	4.0	3.9	3.6	3.4	3.1	3.1
10.5	10.1	5.9	5.4	5.1	4.9	4.6	4.6	4.4	4.1	3.9	3.7	3.6
11.0	10.6	6.4	5.9	5.6	5.5	5.2	5.1	5.0	4.7	4.5	4.2	4.2
11.5	11.2	7.0	6.5	6.2	6.0	5.7	5.7	5.5	5.2	5.0	4.7	4.7
12.0	11.7	7.5	7.0	6.7	6.5	6.2	6.2	6.0	5.7	5.6	5.3	5.2
12.5	12.2	8.0	7.5	7.2	7.1	6.8	6.7	6.6	6.3	6.1	5.8	5.8
13.0	12.8	8.6	8.1	7.8	7.6	7.3	7.3	7.1	6.8	6.6	6.3	6.3
13.5	13.3	9.1	8.6	8.3	8.1	7.8	7.8	7.6	7.3	7.2	6.9	6.8
14.0	13.8	9.6	9.1	8.8	8.6	8.4	8.3	8.1	7.9	7.7	7.4	7.3
14.5	14.3	10.1	9.6	9.3	9.2	8.9	8.8	8.7	8.4	8.2	7.9	7.9
15.0	14.9	10.6	10.1	9.9	9.7	9.4	9.3	9.2	8.9	8.7	8.4	8.4
15.5	15.4	11.2	10.7	10.4	10.2	9.9	9.9	9.7	9.4	9.2	8.9	8.9
16.0	15.9	11.7	11.2	10.9	10.7	10.4	10.4	10.2	9.9	9.7	9.5	9.4
16.5	16.4	12.2	11.7	11.4	11.2	10.9	10.9	10.7	10.4	10.3	10.0	9.9
17.0	16.9	12.7	12.2	11.9	11.7	11.4	11.4	11.2	10.9	10.8	10.5	10.4
17.5	17.4	13.2	12.7	12.4	12.2	12.0	11.9	11.7	11.5	11.3	11.0	10.9
18.0	17.9	13.7	13.2	12.9	12.7	12.5	12.4	12.2	12.0	11.8	11.5	11.4
18.5	18.4	14.2	13.7	13.4	13.3	13.0	12.9	12.8	12.5	12.3	12.0	12.0
19.0	18.9	14.7	14.2	13.9	13.8	13.5	13.4	13.3	13.0	12.8	12.5	12.5
19.5	19.5	15.2	14.7	14.4	14.3	14.0	13.9	13.8	13.5	13.3	13.0	13.0
20.0	20.0	15.7	15.2	15.0	14.8	14.5	14.4	14.3	14.0	13.8	13.5	13.5
20.5	20.5	16.2	15.7	15.5	15.3	15.0	14.9	14.8	14.5	14.3	14.0	14.0
21.0	21.0	16.8	16.2	16.0	15.8	15.5	15.4	15.3	15.0	14.8	14.5	14.5
21.5	21.5	17.3	16.7	16.5	16.3	16.0	15.9	15.8	15.5	15.3	15.0	15.0
22.0	22.0	17.8	17.2	17.0	16.8	16.5	16.4	16.3	16.0	15.8	15.5	15.5
22.5	22.5	18.3	17.8	17.5	17.3	17.0	17.0	16.8	16.5	16.3	16.0	16.0
23.0	23.0	18.8	18.3	18.0	17.8	17.5	17.5	17.3	17.0	16.8	16.5	16.5
23.5	23.5	19.3	18.8	18.5	18.3	18.0	18.0	17.8	17.5	17.3	17.0	17.0
24.0	24.0	19.8	19.3	19.0	18.8	18.5	18.5	18.3	18.0	17.8	17.6	17.5
24.5	24.5	20.3	19.8	19.5	19.3	19.0	19.0	18.8	18.5	18.3	18.1	18.0
25.0	25.0	20.8	20.3	20.0	19.8	19.5	19.5	19.3	19.0	18.8	18.6	18.5
25.5	25.5	21.3	20.8	20.5	20.3	20.0	20.0	19.8	19.5	19.3	19.1	19.0
26.0	26.0	21.8	21.3	21.0	20.8	20.5	20.5	20.3	20.0	19.8	19.6	19.5

Notes:

1. Eb/No = Es/No – 10 Log (Spectral Efficiency).
2. The Required C/N for QEF with FECFrame = 16,200 bits is typically 0.2 to 0.3 dB higher.
3. Shaded values are high error rate or unusable.

Notes:

Appendix C. FAST ACTIVATION PROCEDURE

C.1 FAST System Overview

The CDM-710 Broadcast Satellite Modem is extremely flexible and powerful, and incorporates a large number of optional features. In order to permit a lower initial cost, the modem may be purchased with only the desired features enabled.

If, at a later date, a user wishes to upgrade the functionality of a modem, Comtech EF Data provides **F**ully **A**ccessible **S**ystem **T**opology (**FAST**), which permits the purchase and installation of options through special authorization codes loaded into the unit either via the front panel keypad or entered remotely via the remote port located on the modem rear panel.

These unique access codes may be purchased during normal business hours from Comtech EF Data.

FAST System Theory

FAST facilitates on-location upgrade of the operating feature set without removing a modem from the setup.

With **FAST** technology, operators have maximum flexibility for enabling functions as they are required. **FAST** allows an operator to order a modem precisely tailored for the initial application.

When service requirements change, the operator can upgrade the topology of the modem to meet those requirements within minutes. This accelerated upgrade can be accomplished because of **FAST**'s extensive use of the programmable logic devices incorporated into Comtech EF Data products.

FAST Implementation

Comtech EF Data's **FAST** system is factory-implemented in the modem. All **FAST** options are available through the basic platform unit at the time of order – **FAST** allows immediate activation of available options, after confirmation by Comtech EF Data, through the front panel keypad or via the remote control interface.

FAST Accessible Options

Hardware options for basic modems can be ordered and installed either at the factory or in the field. The operator can select options that can be activated easily in the field, depending on the current hardware configuration of the modem. A unique access code enables configuration of the available hardware.

C.2 FAST Activation Procedure

C.2.1 Obtain Unit Serial Number

Obtain the modem serial number as follows:

a) From the front panel **SELECT:** (main) menu, select **UTILITY → FAST,** then press [**ENTER]**.

b) The modem motherboard Serial Number is displayed on the bottom line, to the left:

```
FAST: Cnfg   View
MainBoard S/N: 333333333
```

c) ***Record serial number:*** _____

C.2.2 View currently installed features

To view the currently installed features, proceed as follows:

a) From the **UTILITY → FAST** menu, select **VIEW**, then press [**ENTER]**.

b) Scroll through the modem Options using the ▲▼ arrow keys, and note which options are '**`Installed`**' or '**`Not Installed`**'. Any that are '**`Not Installed`**' may be purchased as a **FAST** upgrade:

```
View Options: 01 (▲▼)
IF Modulator Installed
```

Note the following (*this listing is representative and is subject to change*):

Option Number (top line)	Description (bottom line)
01	IF Modulator (for CDM-710 70/140 MHz units) L-Band Mod (for CDM-710L L-Band units)
02	IF Demodulator (for CDM-710 70/140 MHz units) L-Band Demod (for CDM-710L L-Band units)
03	FEC Slot 1
04	FEC Slot 2
05	Interface #1
06	GBEI Intf2
07	Tx QPSK
08	Tx 8PSK
09	Tx 16-QAM
10	Tx 16APSK
11	Tx 32 APSK
12	Rx QPSK
13	Rx 8PSK
14	Rx 16QAM
15	Rx 16APSK
16	Rx 32 APSK
17	Tx <=15.0 MS
18	Tx <=22.5 MS
19	Tx <=30.0 MS

20	Tx <=37.5 MS
21	Tx <=45.0 MS
22	Rx <=15.0 MS
23	Rx <=22.5 MS
24	Rx <=30.0 MS
25	Rx <=37.5 MS
26	Rx <=45.0 MS
27	Tx DVB-S1
28	Tx DVB-S2
29	Tx DVB-DSNG
30	Rx DVB-S1
31	Rx DVB-S2
32	Rx DVB-DSNG

C.2.3 Purchase FAST Access Code

Contact a Comtech EF Data sales representative during normal business hours to order features. You will be asked to provide the modem Serial Number. Comtech EF Data Customer Support will verify the order and provide an invoice, instructions, and a 20-character FAST access (configuration) code.

C.2.4 Enter FAST Access Code

Enter the FAST access code as follows:

a) Press **[CLEAR]** to return to the **UTILITY → FAST** menu:

```
FAST: Cnfg   View
MainBoard S/N: 333333333
```

b) Select **Cnfg**, then press [**ENTER]**:

```
FAST Configuration:
Edit Code    Demo Mode
```

c) Select **Edit Code**, then press [**ENTER].**

d) Enter the 20-character FAST code *carefully*. Use the ◄ ► arrow keys to move the cursor to each character, then use the ▲ ▼ arrow keys to edit that character:

```
Edit 20 digit FAST Code:
 00000000000000000000 ENT
```

e) Press **ENTER** when done. The modem responds with "**Configured Successfully**" if the new FAST option is accepted:

```
 Configured Successfully
        (ENTER or CLEAR)
```

Press **[ENTER]** or **[CLEAR]** as directed. The modem will then reset to its default configuration.

f) If, on the other hand, the FAST code is not valid, the code is rejected and following message is displayed:

```
FAST Code Rejected!
       (ENTER or CLEAR)
```

g) Press [**ENTER]** or **[CLEAR]** as directed, then re-enter the FAST code. Contact Comtech EF Data Customer Support if the problem persists.

C.3 Using FAST Demo Mode

When enabled, Demo Mode allows access to ***ALL*** CDM-710 FAST options for 604800 seconds (7 full days). Demo Mode may be turned on and off an unlimited number of times until the 604800 seconds have expired. The decrement countdown to zero seconds occurs only when the mode is *On*.

FAST Demo Mode may be enabled or disabled as follows:

a) Press [**CLEAR]** to return to the FAST menu:

```
FAST: Cnfg   View
MainBoard S/N: 333333333
```

b) Select **Cnfg**, then press [**ENTER]:**

```
FAST Configuration:
Edit Code    Demo Mode
```

c) Use the ◄ ► arrow keys to select **Demo Mode**, then press [**ENTER]**.

```
FAST Demo Mode: Off  On
  604800 seconds remain
```

d) Use the ◄ ► arrow keys to select **Off** or **On**. When *On*, the second line will display the under of seconds remaining available for the free Demo Mode.

IMPORTANT

IF THE DEMO MODE STATE (OFF/ON) IS CHANGED, OR IF DEMO MODE IS ENABLED AND THE TIMER EXPIRES, THE MODEM FIRMWARE WILL AUTO-REBOOT AFTER 5 SECONDS.

NOTE THAT VALIDATION OF AUTHORIZED FAST OPTIONS OCCURS ON AUTO-REBOOT; IF AN INVALID CONFIGURATION IS FOUND, THE MODEM CONFIGURATION WILL RESET TO DEFAULT VALUES.

When the Demo period expires, the following menu is displayed:

```
FAST Demo Mode: Off  On
  Demo Period Expired
```

METRIC CONVERSIONS

Units of Length

Unit	Centimeter	Inch	Foot	Yard	Mile	Meter	Kilometer	Millimeter
1 centimeter	—	0.3937	0.03281	0.01094	6.214×10^{-6}	0.01	—	—
1 inch	2.540	—	0.08333	0.2778	1.578×10^{-5}	0.254	—	25.4
1 foot	30.480	12.0	—	0.3333	1.893×10^{-4}	0.3048	—	—
1 yard	91.44	36.0	3.0	—	5.679×10^{-4}	0.9144	—	—
1 meter	100.0	39.37	3.281	1.094	6.214×10^{-4}	—	—	—
1 mile	1.609×10^{5}	6.336×10^{4}	5.280×10^{3}	1.760×10^{3}	—	1.609×10^{3}	1.609	—
1 mm	—	0.03937	—	—	—	—	—	—
1 kilometer	—	—	—	—	0.621	—	—	—

Temperature Conversions

Temperature	° Fahrenheit	° Centigrade
Water freezes	32	0
Water boils	212	100
Absolute 0	-459.69	-273.16

Formulas
° C = (F - 32) * 0.555
° F = (C * 1.8) + 32

Units of Weight

Unit	Gram	Ounce Avoirdupois	Ounce Troy	Pound Avoirdupois	Pound Troy	Kilogram
1 gram	—	0.03527	0.03215	0.002205	0.002679	0.001
1 oz. avoir.	28.35	—	0.9115	0.0625	0.07595	0.02835
1 oz. troy	31.10	1.097	—	0.06857	0.08333	0.03110
1 lb. avoir.	453.6	16.0	14.58	—	1.215	0.4536
1 lb. Troy	373.2	13.17	12.0	0.8229	—	0.3732
1 kilogram	1.0×10^{3}	35.27	32.15	2.205	2.679	—

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